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REPORT No. 988

JULY 1956

Air Blast Measurements About Explosive Charges At Side-On And Normal Incidence

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DEPARTMENT OF THE ARMY PROJECT No. 5B03-04-002
AND 5B-05-016
ORDNANCE RESEARCH AND DEVELOPMENT PROJECT No. TB3-011
AND TB3-0238

BALLISTIC RESEARCH LABORATORIES

ABERDEEN PROVING GROUND, MARYLAND

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ABERDEEN PROVING GROUND, MARYLAND

TABLE OF CONTENTS

PAGE

ABSTRACT 3

INTRODUCTION 5

TEST SET UP 6

EXPERIMENTAL PROCEDURE 9

COMPUTATIONAL PROCEDURE 11

RESULTS 14

DISCUSSION 19

FUTURE WORK 22

REFERENCES 25

APPENDIX I: Description and Utility of a "Face-On" Pressure Gage 27

APPENDIX II: Description of "Side-On" Gage 31

APPENDIX III: Table of Peak Pressures, Impulses and Durations . . . 33

BALLISTIC RESEARCH LABORATORIES

REPORT NO. 988

AJHoffman/SNMills/rf
Aberdeen Proving Ground, Md.
May 1956

AIR BLAST MEASUREMENTS ABOUT EXPLOSIVE CHARGES AT SIDE-ON AND NORMAL INCIDENCE

ABSTRACT

Measurements of air blast peak pressures, positive impulses, and positive durations for both side-on and normal incidence from bare 50/50 spherical pentolite charges are presented. The explosive weight ranged from 1/2 to 8 pounds, the scaled distance from 1.48 to 14.81 ft/lb$^{1/3}$. Results of two hundred and sixty-nine test firings are tabulated and presented graphically. A description is given of the piezoelectric gage developed to measure the blast in the normally incident waves.

INTRODUCTION

Before the response of a structure to air blast can be predicted, the spatial and temporal loading must be known. Two limiting cases of the blast loading from an explosive charge are (1) the free expansion of the shock wave into undisturbed air (called "side-on") and (2) the reflection at normal incidence of the shock wave from an infinite, rigid wall (called "face-on"). Neither case applies directly for many target structures of military interest, such as aircraft or buildings, because of diffraction. However, peak pressures and impulses* for (1) and (2) represent, in general, lower and upper bounds respectively to the actual loading, and thus may establish limits for calculations of structural response.

Theoretical relations have been advanced for the dependence of side-on peak pressure and impulse on distance.[1,2,3]** Moreover, the relation between side-on and face-on peak pressure is known theoretically as a function of the velocity of propagation of the shock front.[4] On the other hand, theories of face-on impulse are limited to relatively weak shocks.[5,6] Experiments to check these theoretical relations have been extensive,[7] but for the case of side-on impulse have been limited to scaled distances greater that 4 or 5 ft/lb$^{1/3}$. There are practically no data of face-on impulse, especially close to the surface of explosive charges where shocks are quite intense. Since knowledge of the impulse, both side-on and face-on, is very necessary for the prediction of the response of structures to air blast loading, it was decided to carry out a series of experiments to make impulse measurements over an extensive range of scaled distances, concentrating especially at small distances.

---

* Defined as the positive area under the pressure-time history, $I = \int_0^T P(t)dt$, where P is the excess pressure and T is equal to the positive duration

** Numbers refer to reference on page 25.

The present study extends face-on impulse measurements closer to the explosive charge surface than were obtained in a preliminary study reported in Ballistic Research Laboratory Technical Note 788.[8] With the development of a suitable gage it was possible to make measurements as close a 1.5 ft/lb.$^{1/3}$ where the face-on pressure is about 3200 pounds per square inch. The gage development required lengthy experimentation to minimize the effects of accelerometer action resulting from the transfer of momentum to the gage (transducer) by the normally incident shock wave. These accelerometer effects were found to be reduced satisfactorily when the transducer was mounted as an integral part of an extremely massive, reinforced concrete wall. The gage that was found satisfactory and used for these experiments is described in Appendix I.

With an adequate combination of transducer and reflecting surface, measurements were taken using explosive charges of bare 50/50 spherical pentolite of 1/2-, 1-, 2- and 8-pounds. These explosive weights provided an adequate check on scaling laws[9] and permitted measurements over a greater range of pressures than could be achieved with any one charge weight.

TEST SET-UP

The experimental test facilities used for obtaining the blast measurements consisted of massive reflecting surfaces of sufficient size to prevent diffraction of the blast wave before the completion of the positive loading phase. Two such surfaces were employed during the course of the tests, one the wall of a chamber made of two-feet thick reinforced concrete, and the other a 10 ft. x 10 ft. x 1 ft. concrete slab poured on the ground surface. One and one-half inch diameter mounting pipes, with threaded sleeves, were inserted in each of these surfaces to receive and retain the face-on transducer housings flush with the surface. Such mounting permitted the surface of the sensing element of the gage to become essentially an element of the reflecting surface. See Figure 1.

On a line perpendicular to the reflecting surface through the center of an array of face-on gages, as shown in Figure 2, a bare 50/50

FACE-ON GAGES FLUSH-MOUNTED
IN
CONCRETE REFLECTING SURFACE

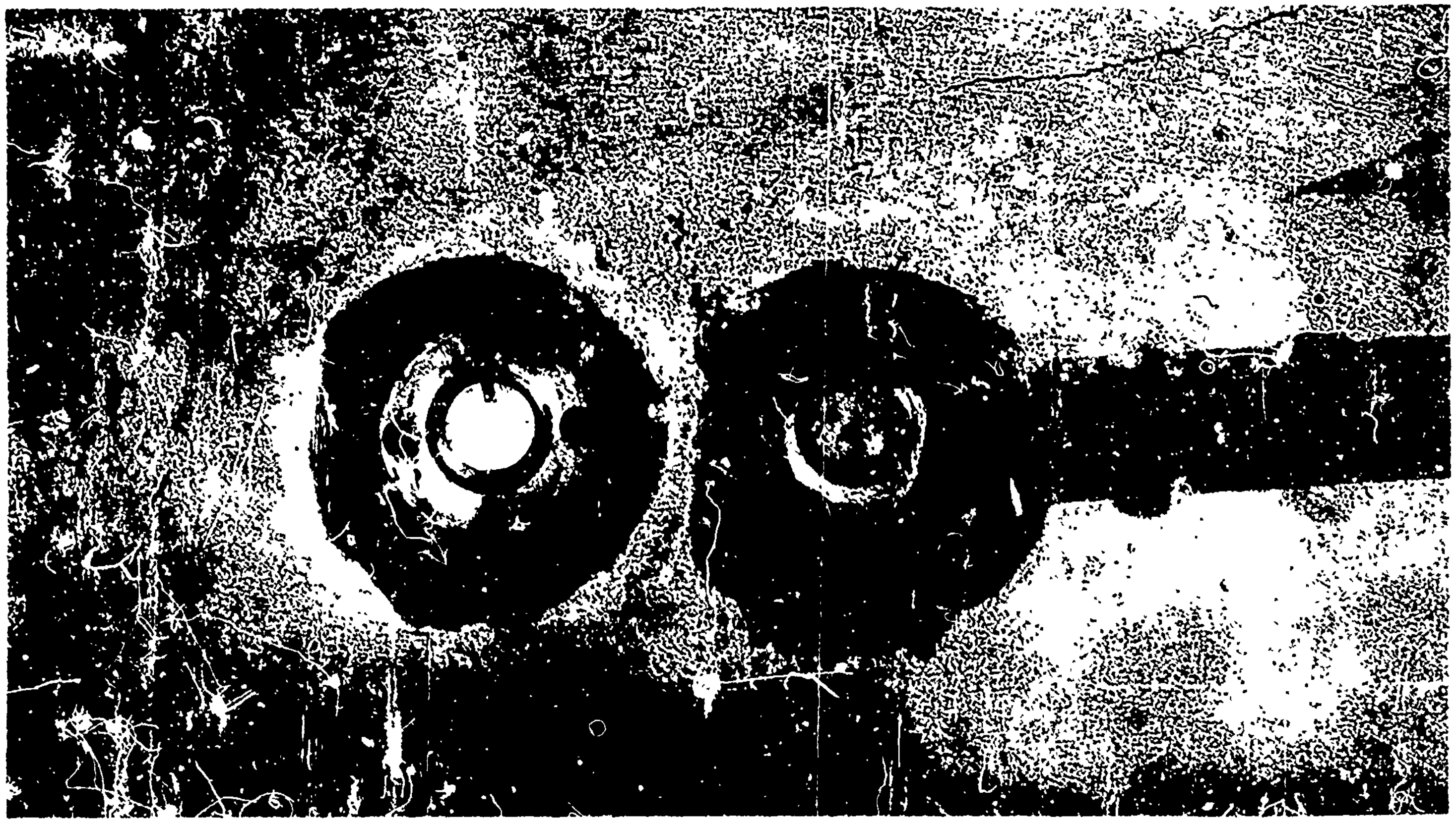
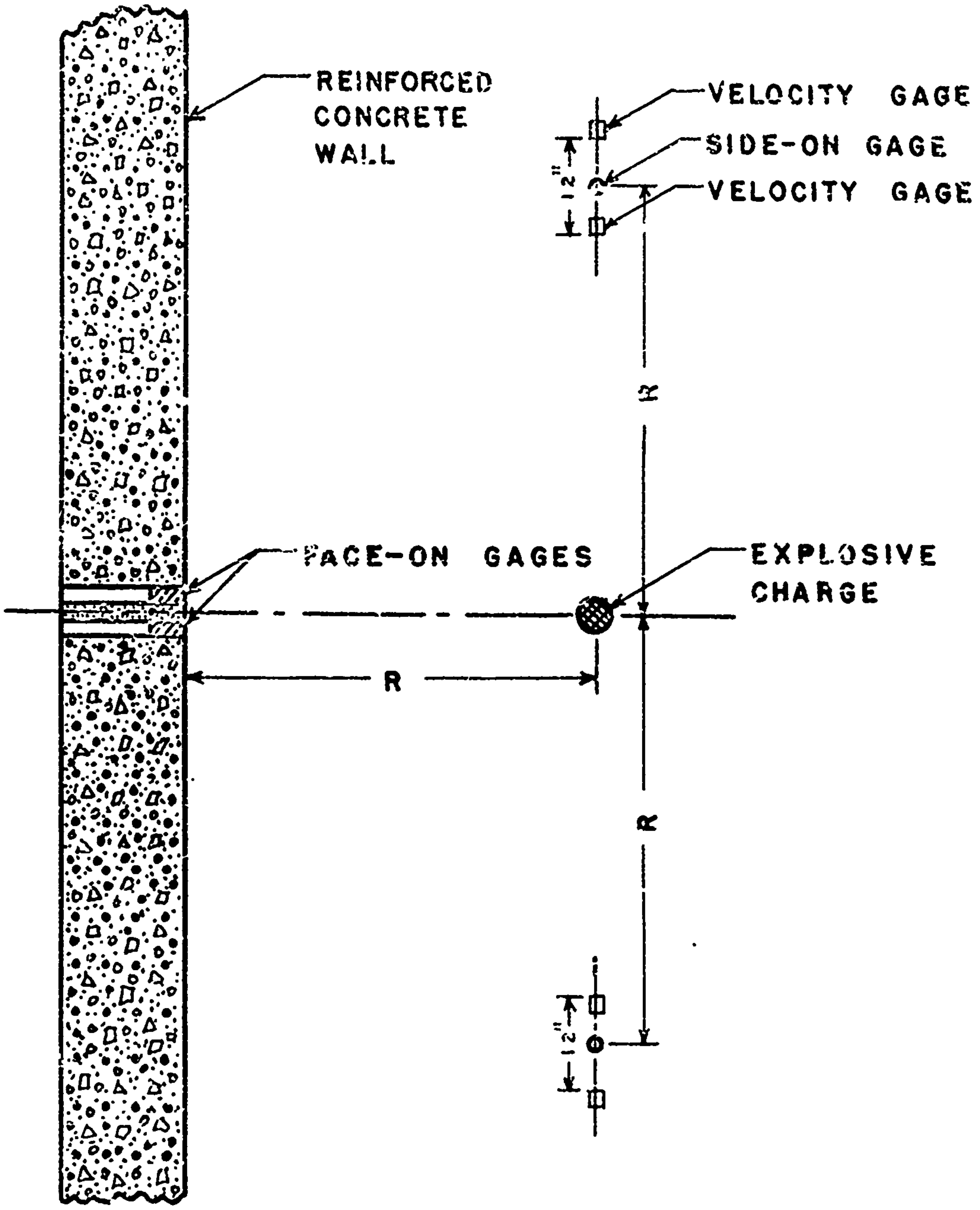


FIGURE 1



ARRANGEMENT OF GAGES ABOUT EXPLOSIVE CHARGE

FIGURE 2

spherical pentolite charge was suspended from an overhead support. In a plane parallel to the reflecting surface through the explosive charge, two positions of side-on air blast gages (see Appendix II) were placed at the height of the charge center. These positions were oriented 180 degrees apart with each gage pointing directly at the center of the explosive. The resulting configuration was that of both side-on and face-on gages lying on points of a circle about the explosive charge as center. Each of the side-on gages was spanned by two piezoelectric "velocity" gages such that they were at the midpoint of the velocity interval. A "velocity" gage merely records time of arrival of the shock front.

The signals from all gages were transmitted through RG62-U coaxial cables having a capacity of 13.5 micro-micro farads per foot to appropriate recording equipment. Pressure-time histories of the blast waves were photographically recorded from cathode ray oscillographic traces and the times of arrival of the shock wave were indicated on electronic counter chronographs.

Meteorological equipment was also provided at the test site for measuring the wind direction and velocity, and ambient atmospheric temperature and barometric pressure.

EXPERIMENTAL PROCEDURE

Prior to making each test firing the explosive was weighed with an analytical balance. The individual weights within a given group of nominal weight were found to differ negligibly from each other since each lot of charges was cast in precision molds. Sample measurements of the density of the explosive were taken for both 1-pound and 8-pound charge weights. Ten spherical charges of each weight were selected at random and values of densities determined. The average density of the 1-pound and 8-pound spheres was found to be 1.588 and 1.612 respectively. (These values are the approximate limits for all of the charge weights used and the density for all explosive weights over the range of the experiments probably differ negligibly from the average of these two.)

Each test charge was suspended from an overhead support and so guyed into position that the radial distances from the charge center to all waveform gages (face-on and side-on) were equal. The interval between the two velocity gages at each position was measured accurately with a jig which assured proper spacing both vertically and horizontally about the side-on gage stationed at the midpoint. Each explosive charge was initiated at its center with a Corps of Engineers special electric detonator to assure reproducible initiation of all charges over the range of weights used. The detonators and the electrical leads were oriented in such a manner that any metal fragments resulting from the detonation would be directed away from the gages.

Before a group of explosives was fired, all gages and connecting cables were checked for continuity and proper impedance. A gage or line was replaced wherever its impedance dropped below 1000 megohms because the excess leakage of electrical charge that would thereby be caused could lead to inaccurate measurements of duration. The individual firings were conducted from an automatic sequence timer which initiated the detonation of the explosive charge, started the high speed recording cameras, and intensified the sweep of the oscillographic traces. Measurements of ambient temperature, atmospheric pressure and the wind direction and velocity in the vicinity of the tests were obtained as near to the time of firing as possible. Immediately after each round the shock wave arrival times were recorded and irregularities noted. Film records of the pressure-time histories were processed promptly so that any discrepancies arising in the system might be detected and corrected without an appreciable loss of data. Since the blast parameters (excess pressure, positive impulse and positive duration) were desired over as great a range of scaled distances* as practicable,

---

* Scaled distance, z, is equal to $R/W^{1/3}$ where R is the distance to the charge center and W the weight of explosive.

identical firings were repeated at each of many different scaled distance values until reliable statistical averages were obtained.

COMPUTATIONAL PROCEDURE

I. Side-on Pressure

Measurement of the transit time of the blast wave over a fixed distance interval between a pair of velocity gages yields an average velocity over the interval. This velocity has been shown to be equal to the velocity at the interval midpoint[10] where side-on gages are located. A mean value of the shock velocity for calculating the excess shock pressure was obtained by averaging the measured transit times for the two positions of velocity gages.

Excess side-on pressures were obtained from the Rankine-Hugoniot condition

$$\frac{P_s}{P_o} = \frac{2\gamma}{\gamma + 1} \left[\left(\frac{V^2}{C^2} - 1\right) \right] \qquad (1)$$

where

P_s = side-on excess pressure, psi
P_o = Ambient atmospheric pressure, psi
V = shock velocity in still air, ft/sec
C = sound velocity in air ahead of shock, ft/sec
γ = ratio of specific heats (equal to 1.4 for air)

This relation was used over the range of pressures for which γ was essentially equal to 1.4. For pressures higher than 20 atm. γ is no longer constant since air does not behave as an ideal gas. For these higher pressures the specific heat at constant volume, C_v, was assumed to be a linear function of temperature and the side-on pressure was obtained from the velocity of propagation using data prepared by Doering and Burkhardt.[3]

7

II. Face-On Pressure

Assuming the shock wave to be spherically symmetric,* inferences of the face-on pressure at the reflecting surface, where transit time measurements of the shock wave could not be taken,[4] were made from a knowledge of the side-on pressure using the relation

$$\frac{P_r}{P_s} = 2 + \frac{6y}{y + 7}$$

where P_r = face-on excess pressure, psi

$y = P_s/P_o$

In this expression, P_s is the excess side-on pressure computed from equation (1) using an average of the shock velocities for the two side-on positions.** This relation also fails for side-on pressures above 20 atmospheres. Therefore, face-on pressures in the high pressure region were obtained by again using an analysis due to Doering and Burkhardt.[3]

---

* This assumption appears valid since spherical charges were used and measurements by velocity gages, orientated 180 degrees apart, indicated symmetry except for small perturbations.

** If the blast wave had spherical symmetry, except for small perturbations, this value of P_s computed from the average value of shock velocity would more likely yield the side-on pressure incident on the reflecting surface than would the value of P_s calculated at either position.

III. Gage Constants

With excess pressures known from the velocity measurements, gage sensitivities for both side-on and face-on gages were computed from the formula

$$KA = \frac{H}{S} \times \frac{Q}{P}$$

where

KA = gage sensitivity, micro-microcoulombs/psi

H = height of initial peak of pressure-time history on a record

S = average voltage calibration step size on a record

Q - calibration charge, micro-microcoulombs

P = excess pressure, psi

Heights of H and S were measured on the same arbitrary scale from the individual record.

Calculated values of the individual gage constants appeared to be somewhat erratic because of inability to determine accurately the magnitude of the initial peak. These variations were most pronounced with high pressure, short duration pulses. Since static calibrations* of several gages showed the gage sensitivity to be linear over a range of pressures from 100 to 10,000 pounds per square inch, a mean of the KA was assumed over all firings to which the gage was subjected.

---

* A static calibration consists of subjecting a gage to a precisely known pressure and recording the output on a galvanometer when the load is suddenly released. This calibration, while indicating linearity, does not yield a KA necessarily equal to the KA obtained in field firing.

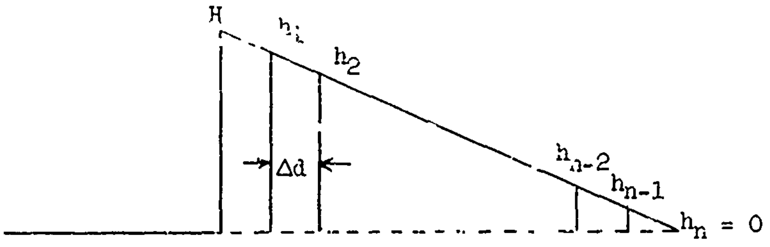
This mean value was then used to compute the positive impulse of each round for which the gage was used.

IV. Positive Impulses

Positive impulses were obtained from the formula $I = \frac{M \times Q}{KA \times U \times S}$

where I = impulse, psi-ms.
M = area under the positive phase
U = time scale factor, scale units/ms.

The area M was computed by the trapezoidal rule from ordinates measured at small equal intervals on the film records as shown below (all measurements to the same scale as S).



$$M = \Delta d \left[\frac{H}{2} + \sum_{1}^{n-1} h_n \right]$$

The films were read on precision film readers by the Analytical Laboratory, Development and Proof Services, and the data obtained were tabulated and recorded on IBM cards. From these tabulated data, the Computing Laboratory of BRL computed the impulses.

RESULTS

Excess pressures, positive impulses and positive durations over a range of scaled distances from 1.48 to 14.81 ft/lb.$^{1/3}$ and a range of explosive weights from 1/2 to 8 pounds are presented graphically in figures 3,4, and 5 respectively. These data represent 269 firings for which individual values of the blast parameters, and also average values for a given group are reported in Appendix III. Typical records of side-on and face on pressure-time histories are presented in Figure 6. These parameters were found to scale according to the dimensional laws proposed by Sachs[9],

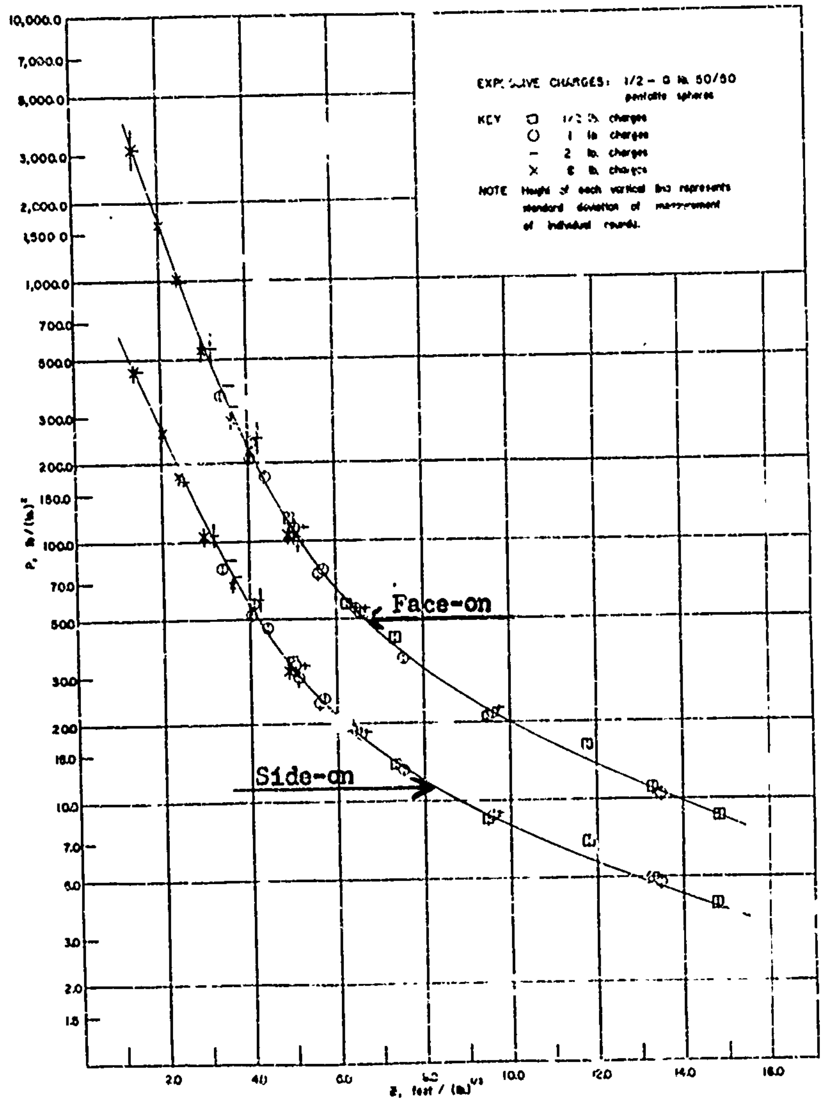


FIGURE 3

FACE ON AND SIDE ON PEAK PRESSURE vs SCALED DISTANCE

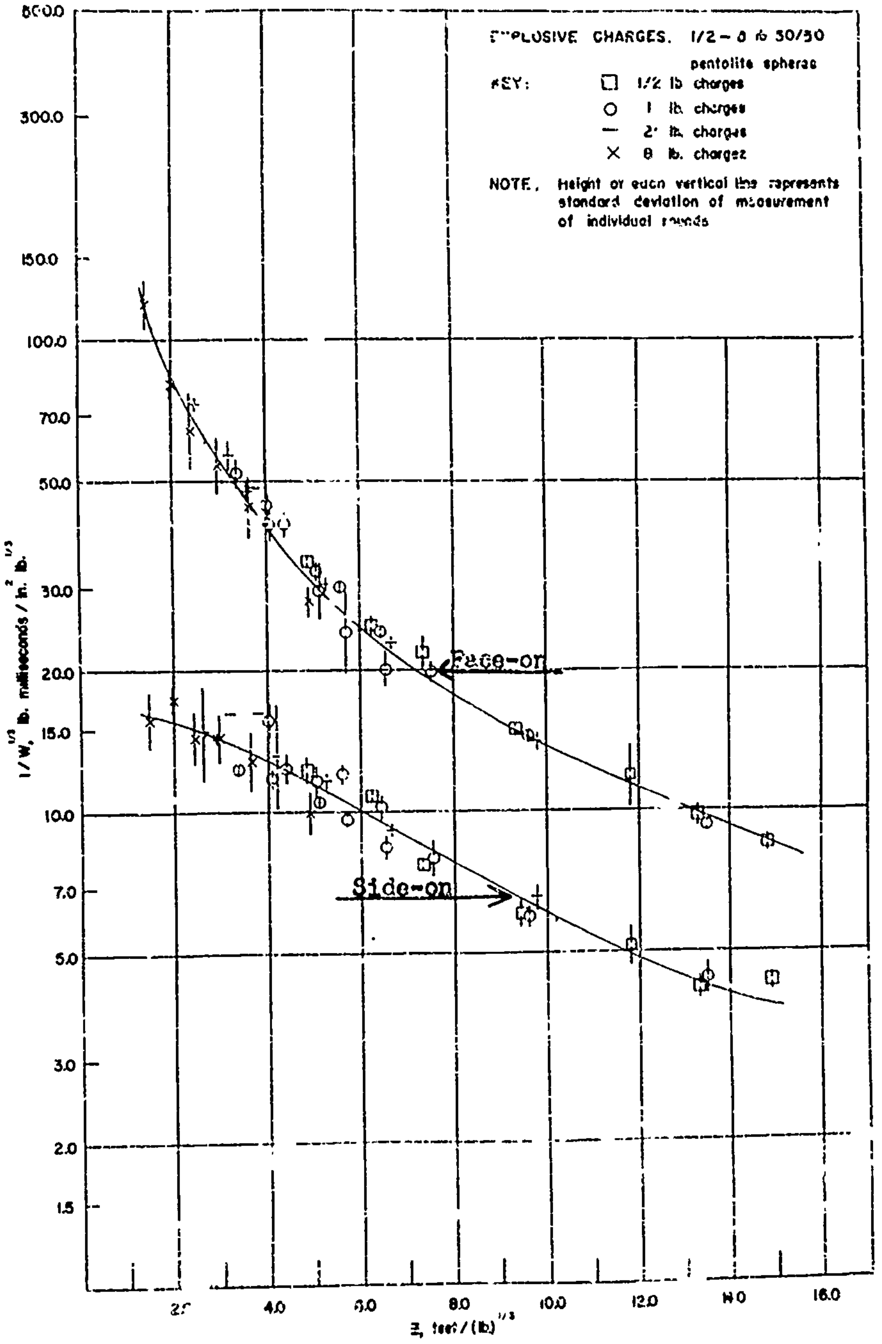


FIGURE 4

FACE ON AND SIDE ON

SCALED IMPULSE vs. SCALED DISTANCE

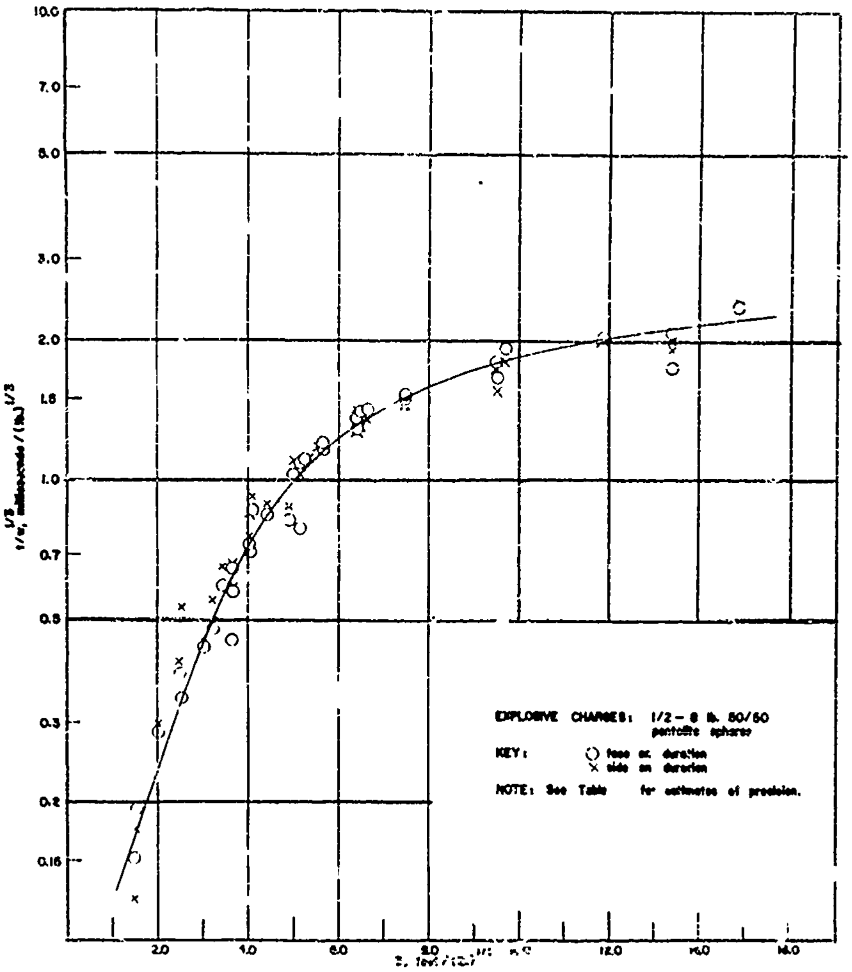
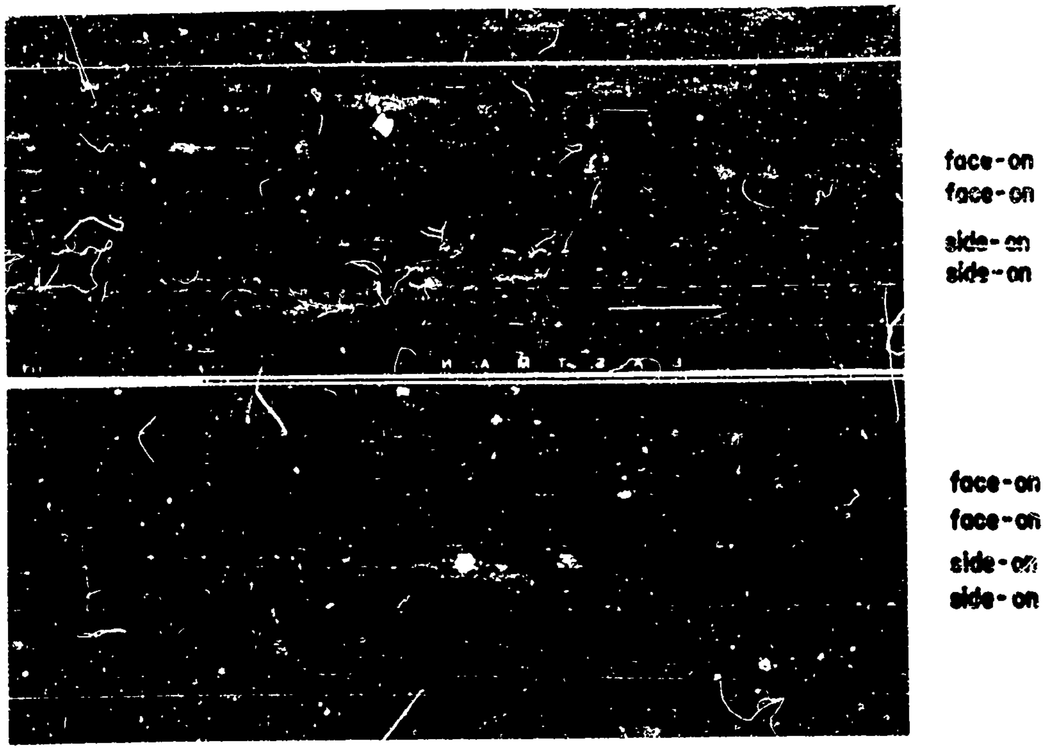


FIGURE 5

FACE ON AND SIDE ON SCALED DURATION vs. SCALED DISTANCE

PRESSURE-TIME HISTORIES FROM 50/50 PENTOLITE SPHERES

ROUND 105



ROUND 112

FIGURE 6

and the different explosive weights used are presented on scaled curves for both reflected and side-on incidence. The durations of the reflected and side-on blast waves, however, were found to be statistically equal within the range of experiments and are combined into a single scaled duration curve.

DISCUSSION

The range of scaled distances over which data were taken is the region of great interest for structural damage from high explosive charges. However, the exact limits of the range chosen were dictated by test conditions. It was found that in the high pressure region the rapid fall-off and short duration of the pressure-time histories made accurate readings of areas under the curves difficult. In addition, the quality of the records deteriorated as the gages were placed closer and closer to the explosive charge. In light of these facts, it was decided that data taken at scaled distance values less than about 1.5 would be questionable, and high pressure tests were accordingly discontinued at 1.48. The upper limit of scaled distance was taken at approximately 15 because it had been found in many test firings against a variety of target structures that scaled distances greater than 15 are out of the damage region for explosive weights less than 1000 pounds. Threshold damage to military targets tends to be a function of only peak pressure for weights beyond several thousand pounds.

A measure of the precision of the measurements may be seen in Figures 3, 4, and 5, and Appendix III, where the standard deviations for each set of firings are given. Values of side-on pressure and impulse presented are in good agreement with the average curves of data taken previously by these Laboratories. However, side-on impulses are somewhat at variance with the predictions of Kirkwood and Brinkley as shown in Figure 7. The question of correcting all impulse measurements to allow for differences in ambient temperature was considered, but investigation showed that the extremes of the temperature range could account for less than a 5 percent

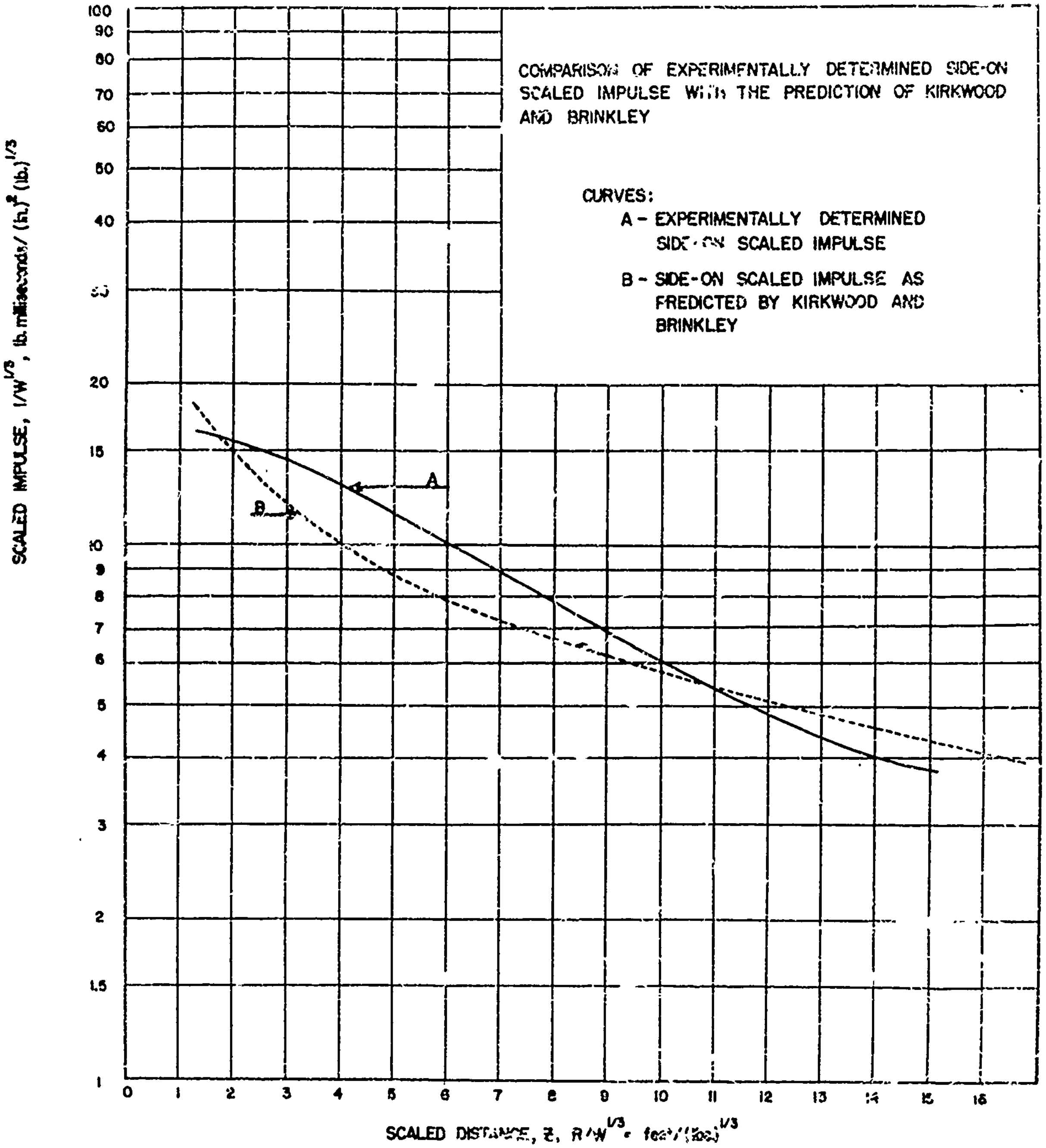

COMPARISON OF EXPERIMENTALLY DETERMINED SIDE-ON SCALED IMPULSE WITH THE PREDICTION OF KIRKWOOD AND BRINKLEY
CURVES:
A - EXPERIMENTALLY DETERMINED SIDE-ON SCALED IMPULSE
B - SIDE-ON SCALED IMPULSE AS PREDICTED BY KIRKWOOD AND BRINKLEY
A
B
SCALED IMPULSE, I/W^1/3, lb.milliseconds/(in.)^2(lb.)^1/3
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SCALED DISTANCE, Z, R/W^1/3, feet/(lbs)^1/3

FIGURE 7

variation in impulse. Since the standard deviations of the impulse measurements averaged approximately 10 percent, the temperature correction was not included.

Fitting analytical expressions to the data was given careful consideration. It was desired to fit the data accurately, but physical considerations made using the method of least squares undesirable. An objection to finding analytic expressions for the data is that no reliable extension beyond the range of measurement could be made from these expressions. This follows from the fact that the range of measurement extends just into the pressure region where the ideal gas assumption for air breaks down. Therefore, no reliable extrapolation of the data could be made. Indeed, Kirkwood and Brinkley[2] have predicted that the side-on impulse curve goes through a maximum at a scaled distance of 1.00, and an analytic fit to the data could never be expected to show a maximum outside the range of measurements. Therefore a method of centroids was used to plot curves through the data. Groups of points were chosen, and the weighted* average of the coordinates was calculated. These weighted average points described smooth curves, from which reliable values of the blast parameters could be obtained.

It is believed that measurements of face-on impulse and face-on duration at scaled distances less than 5 are being presented for the first time. Face-on impulses from a scaled distance of 5 to 15 are in agreement with results of preliminary firings presented previously.[8]

Since the face-on duration equals the side-on duration within experimental error, it seems logical to attempt to relate the face-on and side-on impulse analytically by using a relation between face-on and side-on pressure. Makino and Shear[11] have attempted to fit the experimentally determined face-on impulse curve by assuming the normal reflection formula to hold behind as well as at the shock front. With this assumption it is

---

* Weighted according to the number of observations.

possible to find face-on impulse by integration for any known shape of the side-on pressure-time history. Three cases were chosen by Makino and Shear for comparison with the experimental results:

Case I: $p_s(t)$ was assumed to decay exponentially with time,

$p_s(t) = P_s e^{-kt}$, where P_s is the peak side-on pressure and the constant k is adjusted to fit known conditions. The normal reflection formula,

where $$p_r(t) = p_s(t) \left(2 + \frac{6y}{y + 7} \right)$$

p_r = face-on pressure

y = $p_s(t) / P_o$

P_o = ambient atmospheric pressure

was then integrated to obtain the face-on impulse.

Case II: $p_s(t)$ was taken to decay linearly with time, $p_s(t) = P_s(1 - kt)$, and the face-on impulse again was found by integrating the normal reflection formula.

Case III: $p_s(t)$ and $p_r(t)$ were both taken to decay linearly with time.

The curves of reflected scaled impulse as a function of scaled distance for these three cases are shown in comparison with the authors' experimental results as Curves I, II and III in Figure 8. Curve I appears to show the best agreement. This is consistent with work performed at these Laboratories and also other installations which associates an exponential shape with the side-on pressure-time history.

FUTURE WORK

It is desired to obtain a check on the accuracy of reflected impulse measurements by a method independent of piezoelectric gages. Experimentation is presently in progress to adapt strain gages on rods and strain gage transducers to impulse measurements. Still another technique is in progress whereby impulse is inferred from the momentum-impulse theorem by measuring the initial velocity imparted to a given mass by the impulsive blast wave loading. It is hoped with the later technique to

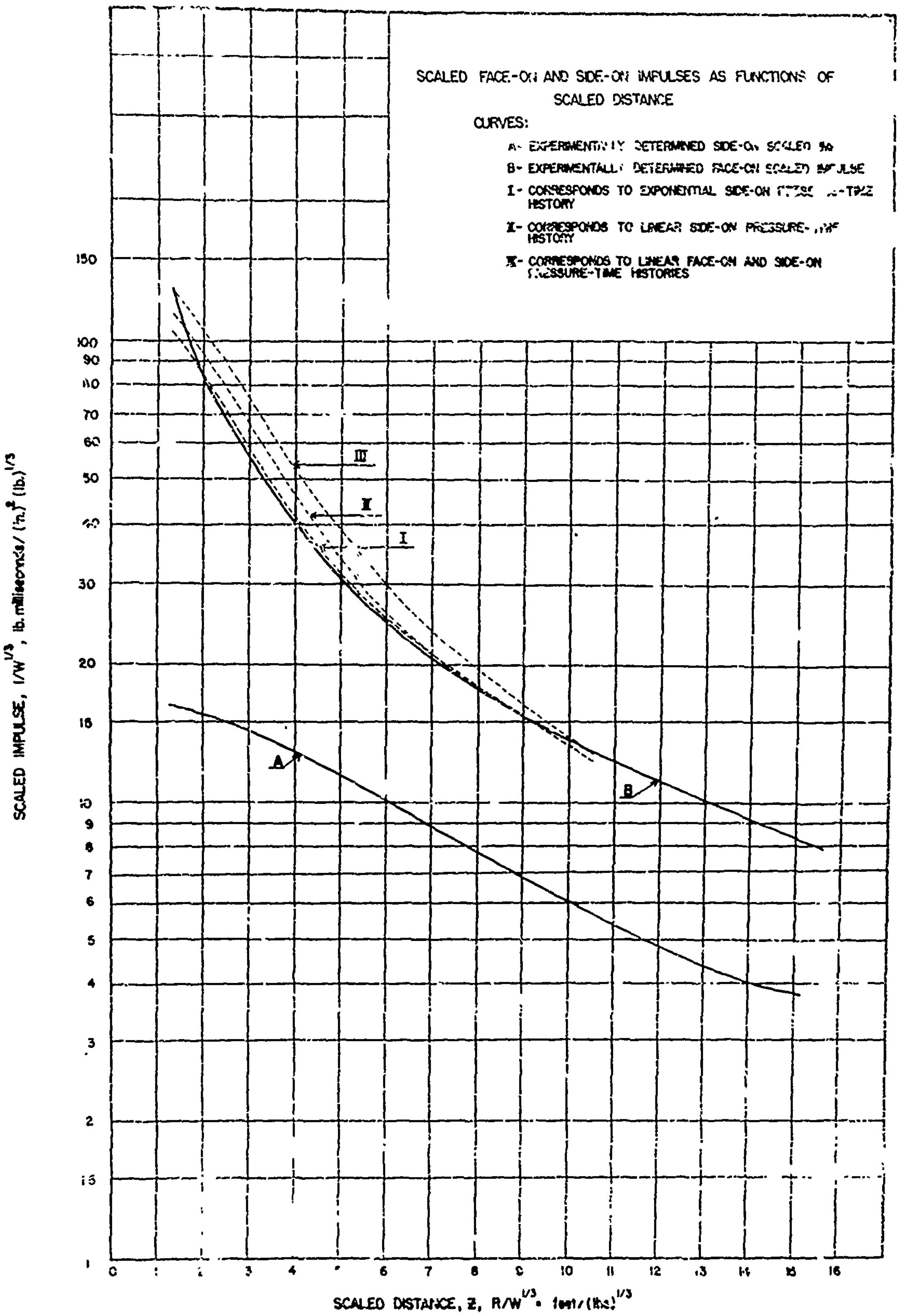

SCALED FACE-ON AND SIDE-ON IMPULSES AS FUNCTIONS OF SCALED DISTANCE
CURVES:
A- EXPERIMENTALLY DETERMINED SIDE-ON SCALED
B- EXPERIMENTALLY DETERMINED FACE-ON SCALED IMPULSE
I- CORRESPONDS TO EXPONENTIAL SIDE-ON PRESSURE-TIME HISTORY
II- CORRESPONDS TO LINEAR SIDE-ON PRESSURE-TIME HISTORY
III- CORRESPONDS TO LINEAR FACE-ON AND SIDE-ON PRESSURE-TIME HISTORIES
III
II
I
A
B
150
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1.5
1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SCALED IMPULSE, $I/W^{1/3}$, lb. milliseconds/$(\text{in.})^2 (\text{lb.})^{1/3}$
SCALED DISTANCE, Z, $R/W^{1/3}$, feet/$(\text{lbs.})^{1/3}$

FIGURE 8

extend measurements of reflected impulse to shorter scaled distance values where it is believed that impulse loading alone is a criterion for damage to many structures.

It is also hoped that measurements of excess peak pressure, positive impulse and positive duration can be made at different altitudes to provide adequate checks on Sach's altitude scaling laws. With such measurements, better estimates of the lethal envelopes around aircraft and missiles for blast type warheads and correlation of internal blast damage tests with blast measurements may be possible.

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APPENDIX I

Description and Utility of a "Face-on" Piezoelectric Gage

This gage, usually referred to as a "face-on gage," is a piezoelectric transducer used to record the pressure-time history of an air blast wave reflected from the surface of a rigid structure. Essentially, this gage is an element of the reflecting surface and is designed to measure the blast loading impinging on the structure less any structural response.

The sensitive element of the face-on gage consists of two disc-shaped tourmaline crystals, each approximately 0.040 inch thick and 0.75 inch in diameter cemented into a stack together with a copper foil electrode of the same diameter inserted between the positive faces. The negative faces of the crystals are electrically connected through the flap of a second copper foil disc cemented to the lower face of the stack. The entire sensitive element is bonded under pressure to the bottom of a 0.100 inch deep by 1.00 inch diameter cavity located in the threaded end of a brass housing. The electrical charge collected by the positive foil is transmitted by a fine wire through the housing to a coaxial connector on the opposite end while the negative connection is made directly to the gage housing. The clearance between the element and housing is finally filled with a chemically hardened potting compound which, when filed smooth and flat, provides a thin hard surface over the crystals. This construction is relatively invulnerable to high intensity loading except for direct hits from occasional fragments. A schematic drawing of this gage is shown in Figure 9.

Several techniques concerned with measurements of reflected pressures with a piezoelectric gage were revealed through considerable experimentation.. It was first discovered that a rigid backing for the crystal stack was necessary to prevent spurious signals resulting from flexure of the crystals under load being superimposed on the record. It was ascertained also that a housing with considerable mass was desirable to prevent excessive gage motion for the duration of the pulse. These characteristics were resolved through use of cylindrical brass housings, approximately 1.5 inches in diameter, and ranging from four to six inches in length.

FACE-ON GAGE

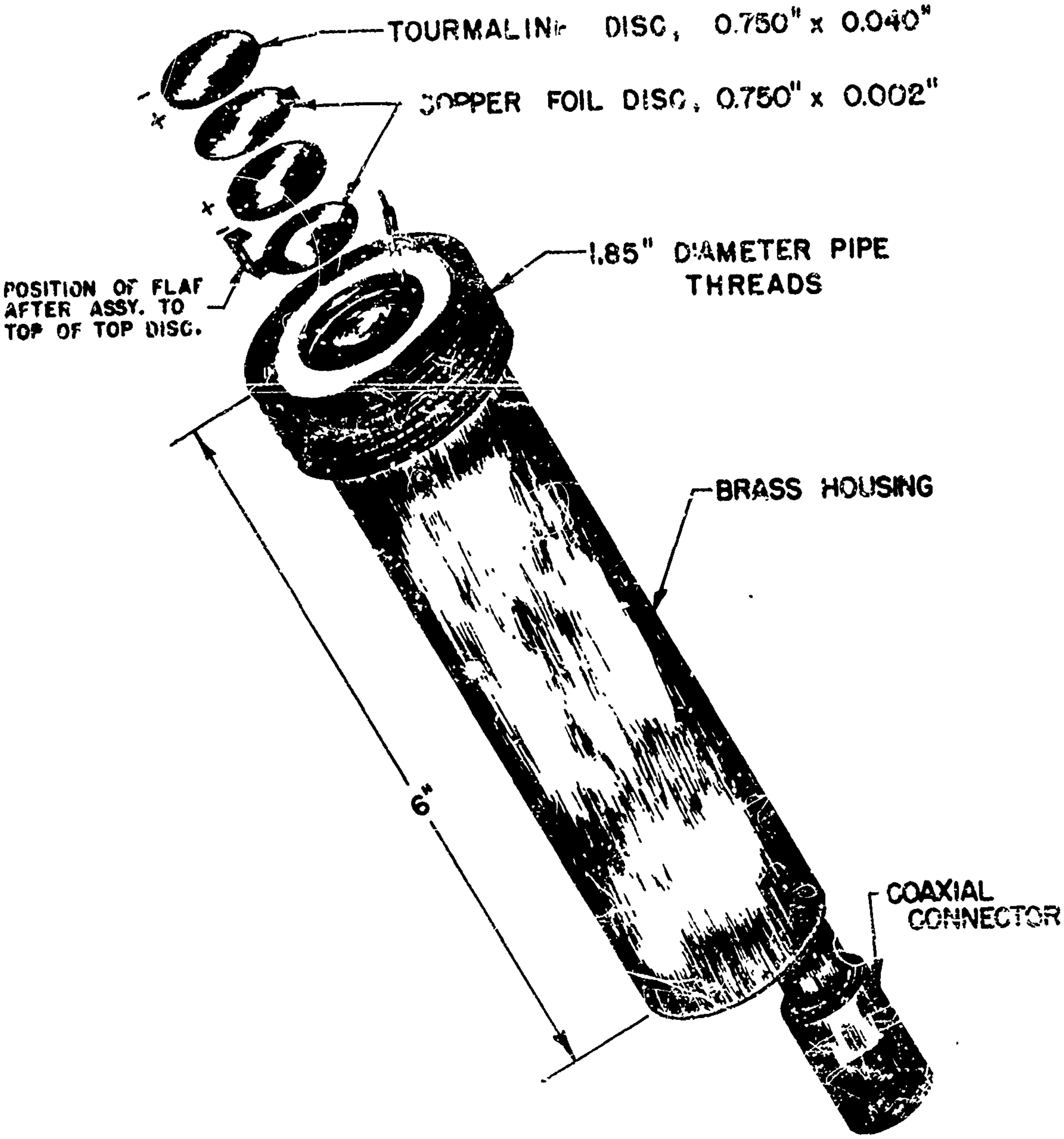


FIGURE 9

APPENDIX I (Continued)

Initially, a flat steel plate was used as a reflecting surface. The pressure-time history of the blast wave was masked by oscillations caused by vibrations of the plate, which were coupled through the gage housing to the sensing element. Attempts to isolate the gage from the reflecting surface resulted in relative motion between the gage and reflector which appeared on the record as an acceleration response due to translation of the gage under the blast load. As a result, an extremely massive reflecting surface was suggested in which these phenomena could not occur. The face-on gage was finally secured into a rigid concrete structure as an element of the surface. Satisfactory reflected pressure-time histories, relatively free from spurious oscillations, were then obtained up to pressure intensities of about 4000 pounds per square inch.

APPENDIX II

Description of "Side-On Gage

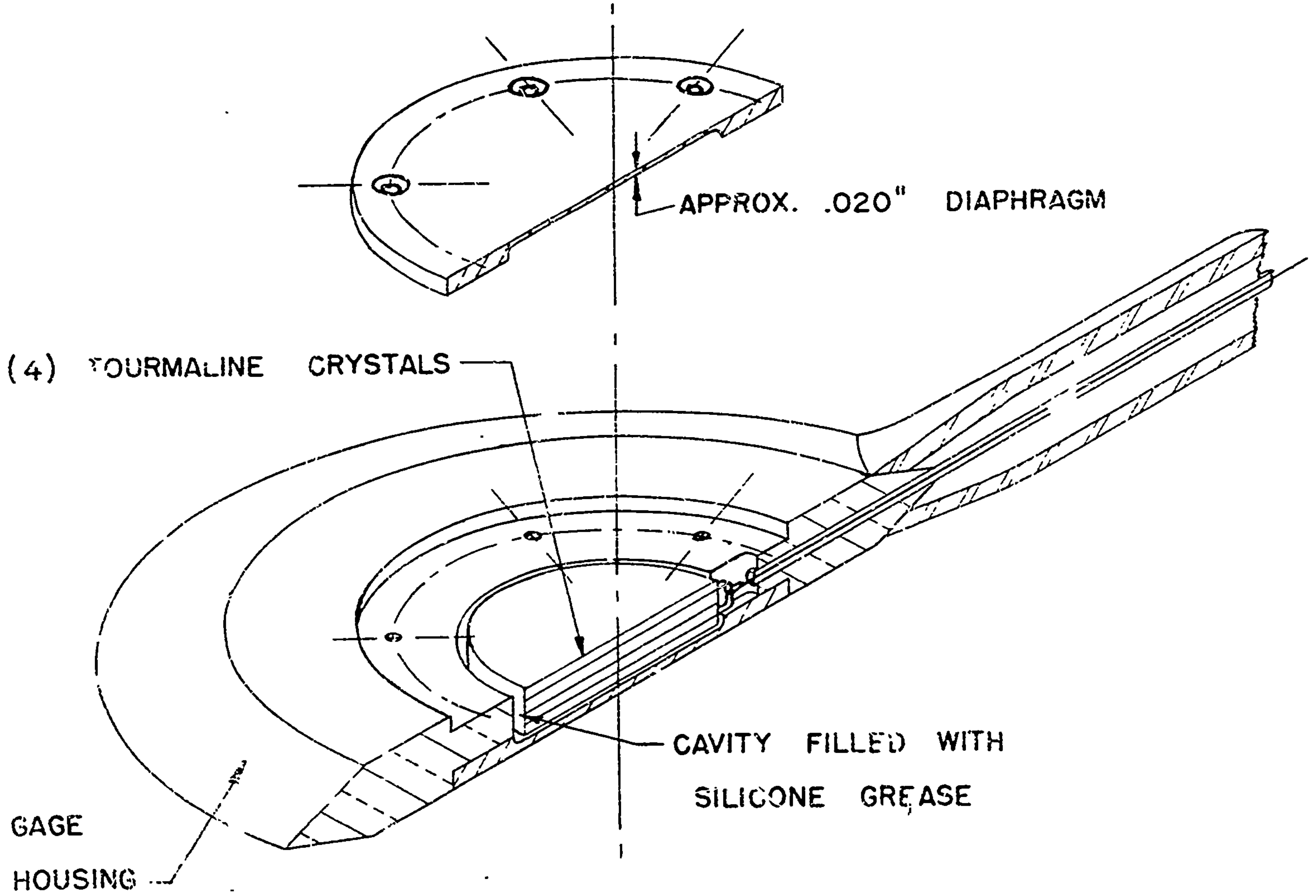
The Stressed Diaphragm BRL Gage is a piezoelectric air blast gage for recording the side-on pressure-time history associated with blast waves. This gage, which in its original form was developed by Mr. Roy Sampson, formerly of BRL, has been used with a great deal of success in small charge (3/8 lb. to 64 lb.) air blast experiments.

The sensitive element of the Stressed Diaphragm BRL Gage is a stack of four wafer shaped tourmaline crystals, approximately .050 inches thick, with silver foil electrodes between crystals to collect the charge. The crystals are usually one inch or one-half inch in diameter but gages have been built in which the diameter of the crystals was as small as one-eighth inch.

The design principle which is believed to be most directly responsible for the success of the S.D.BRL Gage is the preloading of the crystal stack by brass diaphragms approximately .020 inches thick. Interference between the crystal stack and the cavity in the gage housing of from .0005 to .002 inches has been found to give the best results. Silicon grease applied between the faces of the stack and the brass diaphragms as well as in the clearance around the stack is helpful in damping spurious oscillations.

The quality of the workmanship in machining the housing, grinding and polishing the tourmaline crystals, and assembling the crystals into the housing has been found to be of the utmost importance in producing gages which give records of high fidelity. A schematic drawing of this gage is shown in Figure 10.

FIGURE 10



THE STRESSED DIAPHRAGM BRL GAGE

APPENDIX III

TABLE OF PEAK PRESSURES, IMPULSES AND DURATIONS

TABLE OF PEAK PRESSURE, IMPULSE AND DURATION

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$	*Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2				Duration of Positive Phase in msec				Average Scaled Impulse		Average Scaled Duration	
							Side-On		Face-On		Side-On		Face-On		lb msec/in^2 lb$^{1/3}$		msec/lb$^{1/3}$	
				ft/lbs$^{1/3}$	Side-On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Side-On	Face-On	Side-On	Face-On
3	14.91	19.0	1.053	13.46	4.24	9.47	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
4	14.91	19.5	1.053	13.46	4.51	10.15	4.65	Lost	9.49	9.73	1.875	1.845	1.800	1.756				
5	14.75	21.0	1.053	13.46	4.90	11.13	4.59	Lost	9.29	9.71	2.024	2.083	1.726	1.875				
6	14.72	23.3	1.053	13.46	4.84	10.98	4.71	4.41	9.07	9.33	2.017	1.813	1.[illegible]96	1.784				
7	14.72	23.3	1.053	13.46	4.75	10.75	4.78	3.60	9.51	9.47	1.895	1.808	1.720	1.749				
AV				13.46	4.65	10.50	4.45		9.45		1.887		1.733		4.38	9.29	1.887	1.733
σ				---	0.27	0.68									0.35	0.21	0.089	0.056
8	14.71	23.1	0.532	13.41	4.84	10.99	3.58	3.34	7.29	7.65	1.666	1.580	1.753	1.724				
9	14.77	22.8	0.532	13.41	4.73	10.71	3.78	3.25	8.01	6.34	1.775	1.479	1.746	1.746				
10	14.77	23.2	0.532	13.41	5.03	11.45	3.56	3.44	8.10	7.86	1.508	1.550	1.579	1.696				
11	14.77	24.1	0.532	13.41	4.95	11.25	3.57	3.25	8.03	7.78	1.553	1.652	1.591	1.709				
AV				13.41	4.89	11.10	3.47		7.88		1.966		2.087		4.28	9.72	1.966	2.087
σ				---	0.13	0.42									0.23	0.39	0.130	0.086
12	14.75	24.3	1.053	9.53	8.86	21.91	6.49	6.12	15.05	14.12	1.63[illegible]	1.751	1.810	1.484				
13	14.74	2[illegible].8	1.053	9.53	8.60	21.17	6.45	6.18	15.13	14.90	1.58[illegible]	1.614	1.988	2.104				
14	14.73	[illegible]	1.053	9.53	8.99	22.32	5.86	6.03	14.65	14.60	1.666	1.523	1.494	1.494				
15	14.72	2[illegible].3	1.053	9.53	8.85	21.90	6.09	5.66	13.99	Lost	1.501	1.501	1.[illegible]58	1.416				
16	14.73	25.4	1.053	9.53	8.75	21.60	6.14	5.43	14.55	15.27	1.629	1.429	1.828	1.886				
AV				9.53	8.81	21.78	6.04		14.69		1.556		1.677		5.94	14.44	1.556	1.677
σ				--	0.07	0.43									0.32	0.45	0.093	0.123
17	14.81	[illegible]	0.532	9.49	8.50	20.[illegible]	5.06	4.65	11.96	12.04	1.303	1.261	1.[illegible]87	1.387				
18	14.81	24.2	0.532	9.49	9.13	22.70	4.79	4.68	12.08	12.43	1.292	1.375	1.458	1.353				
19	14.85	24.0	0.532	9.49	8.89	21.97	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
20	14.95	19.1	0.532	9.4[illegible]	8.17	19.88	Lost	4.85	12.26	11.52	Lost	1.381	1.619	1.476				
21	14.95	18.9	0.532	9.[illegible]	8.[illegible]4	21.51	Lost	5.49	Lost	11.99	Lost	1.567	1.475	1.429				
AV				9.49	8.69	21.38	4.92		12.10		1.736		1.782		6.07	14.92	1.736	1.782
σ				--	0.029	1.07									0.39	0.29	0.136	0.105
22	14.94	19.2	1.053	7.47	13.70	36.94	8.69	7.49	21.17	20.76	Lost	Lost	Lost	Lost				
23	14.[illegible]	19.0	1.053	7.47	13.[illegible]9	35.26	8.87	7.49	20.96	20.09	1.574	1.389	1.574	1.574				
24	[illegible]	19.[illegible]	1.053	7.47	13.10	34.98	8.96	6.98	19.41	19.01	1.542	1.278	1.49[illegible]	1.542				
25	14.[illegible]8	19.0	1.053	7.47	13.60	36.63	8.94	7.39	Lost	19.96	1.804	1.413	Lost	1.522				
AV				7.47	13.40	35.95	8.10		20.19		1.474		1.512		7.96	19.85	1.474	1.512
σ				--	0.30	0.98									0.82	0.80	0.181	0.031

*Inferred from ab. k velocity.

σ = STANDARD DEVIATION

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ ft/lbs$^{1/3}$	Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2				Duration of Positive Phase in msec				Average Scaled Impulse lb msec/in^2 lb$^{1/3}$		Average Scaled Duration msec/lb$^{1/3}$	
					Side-On	Face-On	Side-On		Face-On		Side-On		Face-On					
							Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Side-On	Face-On	Side-On	Face-On
26	14.75	16.2	0.531	14.81	3.87	8.57	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
27	14.75	16.2	0.531	14.81	3.68	8.11	3.41	3.33	7.30	6.61	1.983	2.107	2.149	1.942				
28	14.93	16.6	0.531	14.81	3.67	8.10	3.55	Lost	7.48	6.60	2.067	Lost	2.000	2.000				
[illegible]	14.93	17.0	0.531	14.81	4.02	8.94	3.47	Lost	7.44	6.84	1.908	Lost	1.754	1.886				
[illegible]	14.84	16.2	0.531	14.81	4.08	9.08	3.45	Lost	7.11	7.81	1.927	1.835	1.972	1.972				
31	14.84	16.1	0.531	14.81	3.97	8.81	3.49	Lost	7.11	6.66	2.009	Lost	1.921	2.009				
32	14.84	16.2	0.531	14.81	3.99	8.87	3.39	3.61	7.40	6.68	1.983	2.047	1.897	1.897				
33	14.80	17.2	0.531	14.81	3.88	8.60	3.52	3.90	7.43	6.93	2.082	2.060	1.868	1.868				
34	14.81	17.4	0.531	14.81	3.85	8.52	3.47	3.50	7.20	6.07	2.009	1.880	2.094	1.858				
35	14.90	17.5	0.531	14.81	4.06	9.04	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
36	14.[illegible]0	17.5	0.531	14.81	3.93	8.72	3.49	3.58	7.17	6.46	1.940	1.853	1.897	1.810				
[illegible]	14.80	17.5	0.531	14.81	4.04	8.98	3.49	3.58	7.12	6.70	1.822	1.864	1.9[illegible]	1.737				
Av				14.81	3.91	8.67	3.50		7.00		1.968		1.923		[illegible]	8.64	2.429	2.374
σ				---	0.14	0.33									0.16	0.52	0.114	0.125
38	[illegible]	15.5	1.067	6.46	17.81	51.32	Lost	Lost	Lost	Lost	Lost	1.288	1.073	1.180				
39	[illegible]	15.0	1.067	6.46	18.56	54.23	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
40	[illegible]	14.2	1.067	6.46	18.86	55.35	Lost	10.50	23.90	24.88	Lost	1.239	1.572	1.150				
41	14.79	15.1	1.067	6.46	19.30	57.00	9.65	11.02	24.54	25.40	[illegible]	1.330	1.073	1.223				
42	14.60	16.0	1.067	6.46	18.72	54.84	9.60	10.36	23.47	22.25	1.283	1.435	1.391	1.174				
43	14.[illegible]0	16.1	1.067	6.46	18.35	53.47	10.16	11.58	25.91	24.97	1.261	1.327	1.327	1.283				
44	[illegible]	16.1	1.067	6.46	18.35	53.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
45	14.61	15.5	1.067	6.46	18.67	54.64	10.84	11.24	24.01	26.61	1.317	1.317	1.652	1.339				
Av				6.46	18.62	54.44	10.55		24.59		1.299		1.269		10.32	24.07	1.271	1.269
σ				--	0.42	1.65									0.56	0.39	0.059	0.159
46	14.[illegible]	15.0	0.532	6.41	19.86	59.09	7.90	8.18	20.40	20.40	1.196	1.217	1.217	1.261				
47	14.[illegible]	11.6	0.532	6.41	19.08	56.17	7.93	8.53	19.03	19.25	1.16[illegible]	1.101	1.057	1.057				
48	14.60	11.8	0.532	6.41	19.44	57.50	Lost	8.99	20.94	20.20	Lost	1.116	1.161	1.116				
49	14.60	12.0	0.532	6.41	19.21	56.65	8.43	8.87	20.56	20.24	1.096	1.140	1.053	0.921				
50	14.6[illegible]	12.5	0.532	6.41	19.56	57.96	8.51	8.60	21.26	21.10	1.174	1.0[illegible]7	1.0[illegible]	1.000				
Av				6.41	19.43	57.47	8.44		20.34		1.147		1.093		10.40	23.08	1.41[illegible]	1.347
σ				--	0.31	1.14									0.47	0.90	0.058	0.125
51	14.87	12.5	1.059	5.64	25.46	80.93	11.62	12.84	32.58	30.56	1.166	1.121	1.300	1.121				
52	14.[illegible]	13.1	1.059	5.64	25.20	75.76	11.91	11.33	31.4[illegible]	30.34	1.205	1.161	1.094	1.027				
53	14.[illegible]	12.1	1.059	5.64	24.63	77.58	11.72	12.66	28.58	29.44	1.250	1.295	1.027	1.027				
54	14.[illegible]3	12.5	1.059	5.64	24.17	75.70	11.38	11.75	30.23	30.53	1.133	1.133	1.044	0.956				
55	14.[illegible]1	12.3	1.059	5.64	22.70	69.87	11.71	12.33	30.46	[illegible]	1.126	1.306	1.351	1.216				
56	14.81	12.7	1.059	5.64	22.81	70.30	11.99	12.59	29.62	30.82	1.250	1.159	1.341	1.125				
57	14.65	11.[illegible]	1.059	5.64	23.87	74.77	12.53	12.47	32.18	31.46	1.269	1.154	1.058	1.192				
58	14.54	11.6	1.059	5.64	24.98	79.01	Lost	Lost	Lost	Lost	1.221	1.202	1.295	1.107				
Av				5.64	24.10	75.49	12.06		30.52		1.197		1.142		12.03	29.94	1.174	[illegible]
σ				--	0.98	3.88									0.49	1.12	0.061	0.123

Rd. No.	Ambient Pressure psi	Ambient Temp °C	Charge Wt., W (lbs)	Scaled Distance R/W^1/3 ft/lbs^1/3	Peak Pressure psi		Impulse of Positive Phase in lb msec/in²				Duration of Positive Phase in msec				Average Scaled Impulse lb msec/in² lb^1/3		Average Scaled Duration msec/lb^1/3	
							Side-On		Face-On		Side-On		Face-On					
					Side-On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Side-On	Face-On	Side-On	Face-On
59	14.60	15.6	1.050	5.04	34.46	121.08	Lost	12.29	32.52	32.37	Lost	1.151	0.852	0.852				
60	14.50	14.9	1.050	5.04	32.29	111.09	Lost	10.90	30.82	31.33	Lost	1.068	0.836	0.986				
61	14.60	14.5	1.050	5.04	31.20	106.21	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
62	14.60	13.8	1.050	5.04	33.43	116.32	Lost	11.99	33.51	32.32	Lost	1.120	0.840	0.896				
63	14.62	15.0	1.050	5.04	35.98	128.12	Lost	11.92	34.14	33.95	Lost	1.056	0.806	0.833				
64	14.62	17.2	1.050	5.04	30.48	102.91	Lost	12.14	35.64	32.69	Lost	1.200	0.857	1.114				
Av				5.04	33.33	115.90	11.85		32.91		1.119		0.887		11.66	32.38	1.070	0.873
σ				--	2.06	9.46									2.41	1.40	0.107	0.092
65	14.70	15.0	0.534	5.00	34.50	120.99	Lost	8.69	Lost	26.74	Lost	1.028	0.806	0.861				
66	14.70	15.0	0.534	5.00	35.98	127.87	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
67	14.72	13.0	0.534	5.00	34.90	122.79	Lost	9.23	29.45	26.93	0.724	0.836	[illegible]	0.864				
68	14.73	13.4	0.534	5.00	36.27	129.18	Lost	9.61	28.71	27.75	Lost	0.877	[illegible]	0.795				
69	14.93	13.0	0.534	5.00	35.98	127.12	Lost	9.64	Lost	28.64	Lost	1.083	[illegible]	0.840				
70	14.98	13.0	0.534	5.00	35.53	125.00	Lost	10.05	27.13	28.03	Lost	0.845	0.805	0.887				
71	14.97	12.8	0.534	5.00	33.65	112.67	Lost	10.32	28.00	29.05	0.822	0.963	0.765	0.793				
72	14.98	12.0	0.534	5.00	34.38	119.69	Lost	9.62	Lost	26.89	0.789	0.930	Lost	0.873				
73	14.95	12.8	0.534	5.00	37.69	135.33	Lost	Lost	29.81	27.76	0.800	Lost	0.829	0.829				
74	14.91	11.6	0.534	5.00	Lost	Lost	Lost	Lost	27.04	27.67	0.806	Lost	0.833	0.661				
75	14.91	11.0	0.534	5.00	34.72	121.44	Lost	Lost	31.18	28.55	Lost	Lost	Lost	0.854				
76	14.91	15.0	0.534	5.00	34.88	122.16	Lost	9.65	29.45	27.96	Lost	0.845	0.817	0.845				
Av				5.00	35.73	126.24	9.60		28.25		0.878		0.828		11.64	[illegible]	1.087	[illegible]
σ				--	1.12	5.90									1.23	[illegible]	0.125	[illegible]
77	14.75	9.6	1.054	4.42	---	---	15.93	Lost	39.29	33.89	0.840	Lost	0.812	0.868				
78	14.75	8.3	1.054	4.42	45.79	176.05	14.73	Lost	41.04	38.41	0.872	Lost	0.831	0.790				
79	14.77	4.9	1.054	4.42	[illegible]	174.37	17.14	9.11	43.41	39.93	0.950	0.894	0.838	0.922				
80	14.75	4.2	1.054	4.42	48.72	191.18	Lost	8.52	42.02	42.85	Lost	1.008	0.804	1.008				
81	14.75	3.3	1.054	4.42	47.60	185.34	16.17	8.84	41.12	42.91	1.014	0.822	0.849	0.877				
82	14.69	6.9	1.054	4.42	46.45	179.57	15.42	8.50	[illegible]	41.89	0.849	0.904	0.849	0.849				
83	14.69	8.0	1.054	4.42	45.04	172.39	15.16	8.01	[illegible]	42.50	0.826	0.826	0.771	0.826				
Av				4.42	46.52	179.81	12.50		41.20		0.891		0.849		12.30	40.49	0.879	0.835
σ				--	1.27	7.13									4.74	2.72	0.070	[illegible]
84	14.95	8.0	1.053	4.03	58.41	242.35	Lost	14.55	46.23	Lost	0.744	Lost	0.771	Lost				
85	14.95	3.6	1.053	4.03	59.14	246.42	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
86	14.93	9.9	1.053	4.03	59.17	246.69	16.59	13.59	41.22	41.95	0.691	0.745	0.691	0.691				
87	14.96	14.6	1.053	4.03	59.57	249.31	16.89	17.25	43.63	49.28	0.868	0.840	0.812	0.812				
88	14.84	15.5	1.053	4.03	58.02	240.77	16.73	Lost	46.82	46.70	0.710	Lost	0.710	0.656				
89	14.84	15.8	1.053	4.03	60.39	253.99	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
90	14.84	15.3	1.053	4.03	60.05	252.09	16.25	Lost	45.39	48.25	0.757	Lost	0.784	0.784				
91	14.84	15.6	1.053	4.03	59.05	246.49	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
Av				4.03	[illegible]	246.24	15.98		45.49		0.765		0.746		15.71	44.82	0.744	0.735
σ				--	.79	4.56									1.34	2.70	[illegible]	[illegible]

Rd. No.	Ambient Pressure psi	Ambient Temp °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ ft/lbs$^{1/3}$	Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2				Duration of Positive Phase in msec				Average Scaled Impulse lb msec/in^2 lb$^{1/3}$		Average Scaled Duration msec/lb$^{1/3}$	
							Side-On		Face-On		Side-On		Face-On					
					Side-On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2	Pos. 3	Pos.	Side-On	Face-On	Side-On	Face-On
[illegible]	14.94	14.5	1.980	3.62	74.46	335.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
[illegible]	14.94	12.9	1.980	3.62	86.49	407.87	Lost	Lost	Lost	60.15	Lost	Lost	Lost	0.560				
Av				3.62	80.47	371.65			60.15				0.560		---	47.89	---	0.446
σ				--	---	---									---	---	---	---
94	14.93	13.2	1.980	3.67	75.45	340.66	21.40	Lost	62.18	60.35	0.727	Lost	0.698	0.727				
95	14.92	13.6	1.980	3.67	74.41	334.58	Lost	19.36	64.90	59.03	Lost	Lost	Lost	Lost				
Av				3.67	74.93	337.62	20.38		61.74		0.727		0.712		16.23	49.16	0.579	0.567
σ				--	---	---									---	1.89	---	---
96	14.83	10.1	0.530	11.84	6.86	16.27	3.84	4.27	8.43	10.7[illegible]	1.411	1.505	1.693	1.599				
97	14.83	9.8	0.530	11.84	7.12	16.99	Lost	4.59	5.36	11.43	Lost	1.709	1.597	1.56[illegible]				
98	14.81	10.1	0.530	11.84	7.07	16.85	Lost	4.39	8.44	10.45	Lost	1.582	1.551	1.524				
99	14.81	9.8	0.530	11.84	7.06	16.81	4.07	4.77	9.73	11.14	1.643	1.571	1.671	1.699				
100	14.81	9.9	0.530	11.84	6.71	15.86	3.80	3.93	8.76	10.52	1.648	1.648	1.566	1.648				
101	14.81	9.9	0.530	11.84	6.95	16.51	4.45	3.99	9.16	10.75	1.733	1.563	1.733	1.790				
Av				11.84	6.96	16.55	4.21		9.[illegible]		1.619		1.657		3.20	[illegible].84	2.014	2.022
σ				---	0.16	0.42									0.41	2.09	0.122	0.101
102	14.58	10.2	0.529	7.45	15.78	44.24	6.39	5.71	16.27	17.39	1.215	1.130	1.215	1.158				
103	14.58	12.2	0.529	7.45	15.48	43.19	Lost	6.38	17.6[illegible]	20.41	1.259	1.182	1.268	1.153				
104	14.58	12.2	0.529	7.45	15.45	43.09	6.57	6.02	16.41	19.85	1.190	1.133	1.331	1.218				
105	14.58	12.0	0.529	7.45	15.20	42.21	6.61	6.39	17.36	19.92	1.133	1.161	1.331	1.218				
106	14.58	9.8	0.529	7.45	16.20	45.71	6.50	6.73	16.89	19.53	1.144	1.102	1.243	1.158				
107	14.61	10.7	0.529	7.45	15.53	43.35	6.02	6.33	15.35	18.46	1.185	1.056	1.042	1.127				
Av				7.45	15.61	43.63	6.33		17.96		1.156		1.209		7.82	22.20	1.428	1.489
σ				--	0.34	1.20									0.37	2.04	0.052	0.104
108	14.83	6.4	1.980	9.71	9.[illegible]	23.12	8.67	7.86	18.[illegible]5	16.93	2.317	2.287	2.405	2.581				
109	14.83	6.2	1.980	9.71	9.[illegible]	22.49	8.82	8.79	17.49	17.31	2.317	2.317	2.698	2.[illegible]63				
110	14.83	5.6	1.980	9.71	9.00	22.32	8.18	7.41	17.61	16.25	2.194	2.023	2.165	2.137				
111	14.83	6.9	1.980	9.71	9.23	22.97	8.48	7.99	16.84	18.04	2.174	2.258	2.404	2.435				
Av				9.71	9.14	22.73	8.27		17.[illegible]		2.2[illegible]		2.418		6.59	14.01	1.780	1.525
σ				--	0.13	0.38									0.40	0.65	0.082	0.152
112	14.83	7.0	1.980	6.63	18.39	53.39	11.83	11.31	28.68	28.94	1.826	1.507	1.681	1.942				
113	14.83	7.0	1.980	6.63	18.71	54.56	11.93	10.76	29.35	27.66	1.925	1.530	1.700	1.813				
114	14.83	7.5	1.980	6.63	18.44	53.55	11.87	Lost	30.12	28.55	1.466	Lost	1.609	1.782				
115	14.7[illegible]	7.2	1.980	6.63	19.47	57.43	11.31	Lost	28.19	27.41	1.850	Lost	1.734	1.850				
116	14.79	7.8	1.980	6.63	18.99	55.64	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
Av				6.63	18.80	54.91	11.50		28.64		1.684		1.7[illegible]4		9.16	22.80	1.33[illegible]	1.405
σ				--	0.44	1.67									0.34	[illegible]	0.162	0.09[illegible]

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ ft/lbs$^{1/3}$	Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2				Duration of Positive Phase in msec				Average Scaled Impulse lb msec/in^2 lb$^{1/3}$		Average Scaled Duration msec/lb$^{1/3}$	
							Side-On		Face-On		Side-On		Face-On					
					Side-On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Side-On	Face-On	Side-On	Face-On
117	14.79	8.0	1.980	5.11	32.23	110.37	16.13	12.70	40.93	Lost	1.577	1.369	1.488	1.756				
118	14.79	8.0	1.980	5.11	32.23	110.37	15.38	12.31	37.99	35.33	1.422	1.223	1.252	1.394				
119	14.79	8.2	1.980	5.11	34.47	120.60	17.45	12.90	40.11	39.02	1.445	1.387	1.358	1.503				
120	14.79	8.2	1.980	5.11	33.36	115.51	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
121	14.79	[illegible]	1.980	5.11	33.83	117.63	16.37	Lost	37.92	35.90	1.382	Lost	1.294	1.118				
Av				5.11	33.19	114.74	14.75		38.31		1.401		1.395		11.54	30.50	1.094	1.112
σ				—	0.70	4.51									1.65	1.51	0.084	0.153
122	14.72	9.3	1.980	4.11	68.09	298.76	17.06	Lost	49.70	47.20	1.092	Lost	1.034	1.034				
123	14.72	14.0	1.980	4.11	55.11	225.46	16.04	Lost	Lost	45.77	1.121	Lost	Lost	1.092				
124	14.72	14.2	1.980	4.11	Lost	Lost	15.10	Lost	Lost	46.85	1.172	Lost	1.084	0.850				
125	14.72	9.2	1.980	4.11	57.19	236.86	15.86	18.02	53.04	50.13	1.138	1.138	1.021	[illegible]				
126	14.61	8.0	1.980	4.11	56.04	231.09	16.67	16.02	53.52	49.41	1.157	1.108	1.108	[illegible]				
127	14.61	8.2	1.980	4.11	69.75	309.22	Lost	Lost	Lost	59.72	Lost	Lost	Lost	1.153				
Av				4.11	61.24	260.27	16.51		50.60		1.129		1.063		13.15	40.29	0.919	0.857
σ				--	7.13	40.50									0.75	3.43	0.021	0.071
128	14.61	10.3	1.980	3.22	108.14	549.79	Lost	Lost	68.51	68.22	Lost	Lost	0.567	0.510				
129	14.61	10.3	1.980	3.22	103.86	521.74	Lost	Lost	71.53	67.48	Lost	Lost	0.583	0.583				
130	14.61	10.3	1.980	3.22	112.98	717.03	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
131	14.78	7.8	1.980	3.22	105.23	528.90	Lost	18.84	66.42	78.23	0.636	0.818	0.665	0.548				
132	14.78	8.0	1.980	3.22	117.19	541.67	22.02	[illegible]	77.99	71.56	0.547	[illegible]	0.658	0.601				
133	14.78	8.4	1.980	3.22	115.98	599.80	Lost	Lost	Lost	Lost	Lost	Lost	0.632	0.574				
Av				3.22	[illegible]	548.38	20.27		71.22		0.684		0.592		16.14	56.70	0.545	[illegible]
σ				--	[illegible]	74.10									---	5.66	---	0.037
134	14.83	8.5	1.980	2.52	170.95	980.05	22.04	14.46	103.0	Lost	Lost	0.667	0.414	Lost				
135	[illegible]	11.1	1.980	2.52	167.07	954.31	17.37	14.40	90.96	78.93	0.481	[illegible]	0.408	0.379				
136	14.91	8.0	1.980	2.52	172.24	987.97	Lost	Lost	77.39	87.49	Lost	Lost	0.410	0.410				
137	14.92	10.9	1.980	2.52	163.66	962.35	16.83	Lost	96.54	93.63	Lost	0.627	0.397	0.369				
138	14.92	[illegible]	1.980	2.52	176.98	1021.76	Lost	17.31	97.23	Lost	Lost	Lost	0.449	Lost				
139	14.92	[illegible]	1.980	2.52	[illegible]	954.26	16.52	29.61	88.71	Lost	Lost	0.646	0.411	Lost				
140	14.66	[illegible]	1.980	2.52	166.13	948.56	18.43	Lost	93.51	97.76	0.770	Lost	0.475	0.403				
Av				2.52	170.57	976.78	18.55		91.38		0.621		0.411		14.76	72.75	0.526	[illegible]
σ				--	[illegible]	26.00									3.76	1.83	0.080	[illegible]
141	14.66	10.5	1.980	1.51	454.23	3138.7	17.97	23.82	Lost	130.5	Lost	0.299	0.232	0.244				
142	14.83	10.8	1.980	1.51	476.49	3321.1	Lost	21.98	169.3	Lost	Lost	Lost	0.239	Lost				
Av				1.51	465.36	3229.9	21.26		149.9		0.299		0.238		16.92	119.3	0.175	[illegible]
σ				--	---	---									---	---	---	---

Rd. No.	Ambient Pressure	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance R/W^1/3 ft/lbs^1/3	Peak Pressure psi Side-On	Peak Pressure psi Face-On	Impulse of Positive Phase in lb msec/in² Side-On Pos. 1	Side-On Pos. 2	Face-On Pos. 3	Face-On Pos. 4	Face-On Pos. 5	Duration of Positive Phase in msec Side-On Pos. 1	Side-On Pos. 2	Face-On Pos. 3	Face-On Pos. 4	Face-On Pos. 5	Average Scaled Impulse lb msec/in² lb^1/3 Side-On	Average Scaled Impulse Face-On	Average Scaled Duration msec/lb^1/3 Side-On	Average Scaled Duration Face-On
[illegible]	[illegible]	11.2	8.330	4.93	30.27	101.65	19.15	18.04	53.96	Lost	57.12	1.581	1.337	1.744	Lost	1.651				
[illegible]	[illegible]	[illegible]	8.330	4.93	31.47	107.22	20.06	17.76	53.25	Lost	53.13	1.479	1.716	1.905	Lost	[illegible]				
[illegible]	[illegible]	[illegible]	8.330	4.93	30.50	109.70	20.61	16.43	51.51	Lost	52.64	2.043	1.734	1.635	Lost	1.667				
[illegible]	[illegible]	12.0	8.330	4.93	31.10	105.78	20.30	Lost	50.36	Lost	54.07	1.938	Lost	1.645	Lost	1.489				
[illegible]	[illegible]	[illegible]	8.330	4.93	31.96	109.30	18.13	16.00	57.04	Lost	Lost	1.686	1.571	2.046	Lost	Lost				
[illegible]	14.72	[illegible]	8.330	4.93	31.36	109.41	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
[illegible]	14.72	13.	8.330	4.93	31.99	109.41	19.89	17.22	59.08	50.98	[illegible]	1.824	1.824	1.626	1.488	1.592				
[illegible]	14.94	14.0	8.330	4.93	31.51	106.79	21.90	17.47	54.83	Lost	52.57	2.075	1.905	1.703	Lost	1.390				
[illegible]	14.94	14.4	8.330	4.93	32.14	109.61	20.74	18.76	45.07	Lost	57.19	1.900	1.833	1.642	Lost	1.453				
[illegible]	14.94	[illegible]	8.330	4.93	31.60	107.19	22.37	18.25	62.36	Lost	62.23	1.757	1.629	1.812	Lost	1.486				
[illegible]	14.91	22.7	8.330	4.93	30.93	104.28	22.95	21.53	65.10	62.07	66.29	1.735	1.871	[illegible]	1.512	1.649				
[illegible]	14.91	21.4	8.330	4.93	31.02	104.67	[illegible]	21.82	42.00	43.58	54.14	1.667	1.803	1.250	1.419	1.622				
[illegible]	14.90	21.1	8.330	4.93	31.76	106.01	[illegible]	20.95	63.19	Lost	65.06	1.739	1.773	1.414	Lost	1.590				
[illegible]	[illegible]	21.4	8.330	4.93	31.60	107.29	[illegible]	19.98	Lost	65.23	61.52	1.705	1.755	Lost	1.727	1.707				
Av				4.93 --	31.42 0.57	106.68 2.52	20.06		56.33			1.759		1.657			5.50 1.03	28.02 2.58	0.872 0.041	0.820 0.097
[illegible]	[illegible]	[illegible]	8.049	3.64	67.86	297.48	24.07	24.65	Lost	127.82	90.11	1.375	1.306	1.701	[illegible]	1.042				
[illegible]	[illegible]	[illegible]	8.049	3.64	70.33	311.97	Lost	22.34	Lost	Lost	Lost	Lost	1.347	Lost	Lost	Lost				
[illegible]	[illegible]	[illegible]	8.049	3.64	67.62	296.13	[illegible]	20.94	62.69	Lost	70.52	1.362	1.296	Lost	Lost	Lost				
[illegible]	[illegible]	[illegible]	8.049	3.64	69.77	308.66	Lost	Lost	Lost	Lost	Lost	[illegible]	Lost	Lost	Lost	Lost				
[illegible]	[illegible]	21.6	8.049	3.64	[illegible]	307.75	25.93	21.02	80.26	Lost	Lost	Lost	1.168	1.458	Lost	Lost				
[illegible]	[illegible]	21.6	8.049	3.64	67.12	292.44	[illegible]	23.16	92.74	95.56	102.27	[illegible]	1.024	1.365	1.065	1.340				
[illegible]	[illegible]	22.4	8.049	3.64	66.48	289.19	Lost	20.22	70.28	96.01	88.70	Lost	1.178	1.185	1.185	1.289				
[illegible]	[illegible]	11.1	8.049	3.64	64.61	270.75	[illegible]	23.61	126.55	89.00	85.46	1.446	1.049	1.597	1.035	[illegible]				
[illegible]	[illegible]	10.8	8.049	3.64	65.40	282.01	29.65	23.91	87.67	75.13	91.07	1.262	1.327	1.259	1.014	1.294				
16	[illegible]	[illegible]	8.049	3.64	67.38	293.38	28.97	[illegible]	77.56	76.32	84.49	1.342	1.107	1.127	1.162	1.268				
[illegible]	[illegible]	10.	8.049	3.64	[illegible]	275.91	31.05	24.76	Lost	Lost	Lost	1.357	1.167	Lost	Lost	Lost				
[illegible]	[illegible]	[illegible]	8.049	3.64	[illegible]	279.35	27.91	24.57	89.95	82.65	85.51	1.358	1.104	1.246	1.174	1.291				
[illegible]				3.64 --	67.15 2.05	292.75 12.32	25.51		86.21			1.250		1.259			[illegible]	43.97 7.36	0.629 0.059	0.618 [illegible]
[illegible]	[illegible]	[illegible]	7.940	3.01	[illegible]	538.62	27.44	23.78	Lost	Lost	Lost	0.870	0.835	Lost	Lost	Lost				
[illegible]	[illegible]	[illegible]	7.940	3.01	[illegible]	539.41	31.64	Lost	106.15	Lost	118.48	0.917	Lost	0.898	Lost	1.000				
[illegible]	[illegible]	22.5	7.940	3.01	110.91	564.75	33.01	Lost	96.07	115.56	127.07	0.891	1.132	0.677	0.891	0.852				
[illegible]	[illegible]	[illegible]	7.940	3.01	[illegible]	541.57	30.43	25.71	Lost	112.62	148.92	[illegible]	0.925	Lost	0.878	0.915				
[illegible]	[illegible]	15.0	7.940	3.01	108.05	546.22	[illegible]	[illegible]	87.21	100.59	111.61	0.977	0.977	0.714	0.821	0.750				
[illegible]	[illegible]	[illegible]	7.940	3.01	103.51	516.57	Lost	Lost	108.17	[illegible]	114.48	Lost	Lost	0.813	0.719	0.755				
[illegible]	[illegible]	[illegible]	7.940	3.01	105.83	531.55	28.50	24.22	Lost	Lost	Lost	0.882	0.850	Lost	0.854	0.991				
[illegible]	[illegible]	[illegible]	7.940	3.01	95.11	458.25	27.81	Lost	Lost	Lost	Lost	0.861	Lost	Lost	Lost	Lost				
[illegible]	[illegible]	[illegible]	7.940	3.01	113.52	561.26	Lost	Lost	82.50	[illegible]	121.22	0.944	[illegible]	1.058	0.890	0.690				
[illegible]	[illegible]	19.1	7.940	3.01	119.42	621.93	34.65	Lost	95.13	[illegible]	107.55	0.922	Lost	1.159	0.924	0.853				
[illegible]	[illegible]	[illegible]	7.940	3.01	[illegible]	602.49	Lost	26.19	77.59	100.00	106.97	Lost	0.772	0.671	0.741	0.777				
[illegible]				3.01 --	108.59 5.78	551.15 38.76	26.46		107.69			0.912		0.855			14.32 1.76	53.96 7.77	[illegible]	[illegible] 0.060

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ ft/lbs$^{1/3}$	Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2					Duration of Positive Phase in msec					Average Scaled Impulse lb msec/in^2 lb$^{1/3}$		Average Scaled Duration msec/lb$^{1/3}$	
							Side-On		Face-On			Side-On		Face-On						
					Side On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Side-On	Face-On	Side-On	Face-On
180	14.71	23.6	8.169	2.48	177.66	1030.24	34.40	Lost	Lost	Lost	Lost	1.032	Lost	Lost	Lost	Lost				
181	14.71	24.4	8.169	2.48	181.36	1016.80	Lost	25.32	130.03	137.14	147.39	0.457	0.535	0.444	0.508	0.429				
182	14.71	27.4	8.169	2.48	180.36	1019.97	Lost	Lost	121.09	128.09	Lost	Lost	0.312	0.457	0.649	0.649				
183		[illegible]	8.169	2.48	182.22	1063.19	24.88	Lost	118.22	129.04	Lost	0.455	0.358	0.630	0.567	0.662				
[illegible]		[illegible]	8.169	2.48	173.26	1013.13	Lost	Lost	113.80	130.72	134.50	Lost	0.555	0.516	0.581	0.677				
185	14.73	26.5	8.169	2.48	169.95	975.06	32.14	31.00	113.57	129.83	Lost	0.965	1.146	0.563	0.594	Lost				
186	14.70	27.0	8.169	2.45	174.51	1007.70	Lost	Lost	106.93	138.79	141.74	Lost	0.505	0.594	0.523	0.646				
187	14.78	20.1	8.169	2.48	171.07	981.71	30.25	Lost	130.52	136.64	133.75	0.678	Lost	0.488	0.473	0.599				
188	14.77	22.2	8.169	2.43	171.70	906.46	Lost	Lost	105.47	126.82	142.00	Lost	Lost	0.536	0.536	0.535				
189	14.77	22 9	8.164	2.45	182.81	1066.30	Lost	Lost	113.36	121.18	138.55	Lost	Lost	0.613	0.767	0.583				
190	14.77	25.?	8.169	2.48	171.03	981.70	Lost	Lost	129.66	132.11	139.60	Lost	Lost	0.405	0.487	0.660				
Av				2.48	176.18	1019.28	29.61		126.52			0.551		0.564			14.?8	63.52	0.34	0.306
σ				--	4.90	35.35											1.65	13.58	0.1	0.042
191	14.64	22.2	7.875	2.01	260.95	1641.14	Lost	34.72	Lost	Lost	Lost	0.464	0.418	Lost	Lost	0.617				
192	14.64	23.7	7.875	2.01	272.17	1725.95	Lost	33.76	140.17	161.85	161.40	0.366	0.381	0.577	0.440	0.534				
193	14.64	24.7	7.875	2.01	260.63	1659.31	Lost	30.49	167.1	Lost	Lost	0.345	0.576	0.535	Lost	0.725				
194	14.70	30.0	7.875	2.01	257.91	1621.99	Lost	38.61	Lost	Lost	Lost	0.352	0.489	Lost	0.571	0.635				
195	14.70	30.2	7.875	2.01	261.21	1797.77	Lost	34.69	Lost	Lost	Lost	0.361	0.393	0.512	Lost	Lost				
196	14.70	30.2	7.875	2.01	26?.11	1706.31	Lost	35.14	Lost	Lost	Lost	0.326	0.451	Lost	0.551	0.578				
197	14.69	30.0	7.875	2.01	25?.95	1592.38	Lost	35.22	Lost	Lost	Lost	0.245	0.429	Lost	Lost	Lost				
198	14.69	30.7	7.875	2.01	26?.30	1677.72	Lost	Lost	Lost	Lost	Lost	0.399	0.533	0.631	Lost	0.554				
Av				2.01	26?.15	1675.40	34.65		157.74			0.383		0.558			17.42	79.27	0.292	0.280
σ				--	6.77	66.33											1.21	6.06	0.050	0.049
199	14.73	21.5	8.169	2.48	172.78	987.62	Lost	26.03	Lost	119.07	123.71	Lost	0.792	0.682	0.497	0.844				
200	14.64	20.2	8.169	2.48	177.9?	1029.10	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
201	14.64	20.7	8.169	2.48	179.?7	1042.?7	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
202	14.65	21.1	8.169	2.4?	[illegible]	1032.4?	Lost	Lost	Lost	Lost	134.75	1.223	Lost	Lost	Lost	1.191				
203	14.?9	21.5	8.169	2.4?	16?.76	965.05	Lost	Lost	110.46	119.02	144.14	Lost	Lost	0.527	0.452	0.508				
204	[illegible]	22.5	8.169	2.?3	172.22	909.77	Lost	30.97	Lost	Lost	Lost	0.681	0.699	Lost	0.565	0.683				
Av				2.4?	176.18	1019.28	28.50		125.19			0.849		0.660			14.58	63.52	0.3?	0.306
σ				-	4.92	35.35											1.69	13.50	0.15	0.042

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ ft/lbs$^{1/3}$	Peak Pressure psi Side-On	Peak Pressure psi Face-On	Impulse of Positive Phase in lb msec/in² Side-On Pos. 1	Side-On Pos. 2	Face-On Pos. 3	Face-On Pos. 4	Face-On Pos. 5	Duration of Positive Phase in msec Side-On Pos. 1	Side-On Pos. 2	Face-On Pos. 3	Face-On Pos. 4	Face-On Pos. 5	Average Scaled Impulse lb msec/in² lb$^{1/3}$ Side-On	Face-On	Average Scaled Duration msec/lb$^{1/3}$ Side-On	Face-On
205	14.79	25.8	8.264	1.48	473.30	3289.4	36.83	32.71	182.27	250.66	268.56	0.478	0.184	0.340	0.386	Lost				
206	14.79	27.7	8.264	1.48	429.21	2922.9	[illegible]	Lost	242.44	251.83	Lost	0.222	Lost	0.300	Lost	0.281				
207	14.79	26.0	8.264	1.48	462.45	3193.2	30.87	34.92	Lost	Lost	Lost	0.199	Lost	Lost	Lost	Lost				
208	14.79	27.4	8.264	1.48	466.94	3255.9	24.22	44.66	253.06	256.25	227.34	0.194	0.272	0.279	Lost	0.261				
209	14.78	27.4	8.264	1.48	480.20	3351.8	Lost	Lost	209.[illegible]	Lost	Lost	Lost	Lost	0.216	Lost	Lost				
210	14.77	27.4	8.264	1.48	520.11	3687.6	30.20	Lost	236.44	Lost	216.88	0.218	Lost	Lost	Lost	Lost				
211	14.75	25.5	8.264	1.48	467.10	3241.7	43.42	Lost	Lost	Lost	238.91	0.269	Lost	Lost	Lost	0.320				
212	14.75	27.9	8.264	1.48	469.09	3259.9	29.7[illegible]	35.79	Lost	Lost	263.22	0.[illegible]	0.276	0.274	Lost	0.329				
213	14.80	25.3	8.264	1.48	487.36	3411.5	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
214	14.74	25.9	8.264	1.48	477.38	3326.6	Lost	Lost	Lost	Lost	238.34	Lost	Lost	Lost	Lost	0.274				
215	14.74	24.9	8.264	1.48	459.10	3202.4	Lost	Lost	Lost	Lost	219.43	Lost	Lost	Lost	Lost	0.325				
216	14.74	27.4	8.264	1.48	455.32	3146.5	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
217	14.74	27.8	8.264	1.48	415.49	3230.5	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
218	14.71	31.0	8.264	1.48	470.69	3308.6	33.40	Lost	Lost	Lost	279.81	0.211	Lost	Lost	Lost	0.325				
219	14.71	31.0	8.264	1.48	44[illegible].01	3025.5	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
220	14.71	31.0	8.264	1.48	433.21	2958.8	29.19	Lost	Lost	Lost	173.07	0.222	Lost	Lost	Lost	Lost				
221	14.71	28.7	8.264	1.48	431.74	2944.5	[illegible].89	Lost	Lost	Lost	Lost	0.275	Lost	Lost	Lost	Lost				
Av				1.48	458.57	3219.3	33.81		241.51			0.245		0.305			16.52	119.44	0.122	0.140
σ				--	22.60	600.0											2.83	14.18	0.046	0.018
222	14.76	28.9	1.049	3.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
223	14.76	28.[illegible]	1.049	3.44	Lost	Lost	Lost	Lost	Lost	Lost	54.09	Lost	Lost	Lost	Lost	0.606				
224	14.76	29.0	1.049	3.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	0.559	Lost	Lost	Lost	Lost				
225	14.82	25.5	1.049	3.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	0.656	Lost	Lost	0.624	0.677				
226	14.82	27.5	1.049	3.44	76.58	350.69	12.64	Lost	Lost	58.13	54.50	0.583	Lost	Lost	0.652	0.600				
227	14.82	27.6	1.049	3.44	76.01	354.87	Lost	12.02	Lost	48.27	Lost	Lost	0.783	Lost	0.466	0.486				
228	14.82	25.8	1.049	3.44	78.42	359.57	Lost	12.78	Lost	52.95	54.73	Lost	0.522	Lost	0.737	0.504				
229	14.88	27.3	1.049	3.44	8[illegible].05	393.78	Lost	12.69	Lost	Lost	Lost	0.762	0.708	Lost	Lost	Lost				
230	14.88	27.2	1.049	3.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	0.727	0.727	Lost	Lost	0.600				
231	14.89	27.5	1.016	3.44	Lost	Lost	Lost	Lost	Lost	Lost	Lost	0.596	0.848	Lost	Lost	0.486				
232	14.89	30.0	1.016	3.44	79.06	362.70	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
233	14.89	30.0	1.016	3.44	80.00	369.68	11.85	12.76	Lost	Lost	Lost	0.536	0.652	Lost	Lost	Lost				
234	14.87	29.[illegible]	1.016	3.44	79.90	358.02	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	0.663				
Av				3.44	79.21	364.15	12.45		53.78			0.667		0.592			12.24	51.89	0.634	0.564
σ				--	2.60	25.80											0.40	3.16	0.109	0.086
235	14.83	29.6	1.016	4.04	51.93	207.74	11.82	11.99	38.93	42.96	42.24	0.619	0.846	0.674	0.643	0.784				
236	14.83	31.4	1.016	4.04	50.59	200.64	12.53	12.41	42.64	49.07	47.72	0.854	1.057	0.566	0.692	0.692				
237	14.83	30.9	1.016	4.04	54.21	219.48	Lost	Lost	36.89	39.56	35.60	Lost	0.856	0.523	0.685	0.623				
238	14.83	31.[illegible]	1.016	4.04	46.51	185.71	12.09	11.47	38.59	43.63	Lost	0.744	0.853	0.739	0.647	Lost				
239	14.83	31.5	1.016	4.04	52.09	208.61	11.28	12.39	41.36	45.12	40.18	0.846	0.906	0.872	0.717	0.727				
240	14.80	32.1	1.016	4.04	50.69	201.28	11.91	11.46	41.17	40.80	44.70	0.833	Lost	0.703	0.527	0.927				
241	14.80	32.9	1.016	4.04	54.05	219.26	11.85	Lost	43.98	Lost	45.85	0.835	Lost	0.746	0.667	0.762				
242	14.80	33.2	1.016	4.04	52.37	210.23	11.70	12.49	39.99	Lost	38.71	0.960	0.960	0.806	Lost	0.[illegible]				
Av				4.04	51.79	207.12	11.90		41.85			0.856		0.711			11.73	40.34	0.844	0.698
σ				--	1.86	9.74											0.41	3.82	0.109	.092

Rd. No.	Ambient Pressure psi	Ambient Temp. °C	Charge Wt., W (lbs)	Scaled Distance $R/W^{1/3}$ $ft/lbs^{1/3}$	Peak Pressure psi		Impulse of Positive Phase in lb msec/in^2					Duration of Positive Phase in msec					Average Scaled Impulse 10 msec/in^2 lb$^{1/3}$		Average Scaled Duration msec/lb$^{1/3}$	
							Side-On		Face-On			Side-On		Face-On						
					Side-On	Face-On	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Side-On	Face-On	Side-On	Face-On
243	14.80	31.4	1.017	5.04	25.79	82.41	10.91	11.29	30.07	Lost	33.26	1.067	1.037	1.160	Lost	1.066				
244	14.80	34.3	1.017	5.04	28.92	95.70	Lost	Lost	Lost	Lost	Lost	0.917	0.979	0.924	0.732	1.083				
245	14.83	33.5	1.017	5.04	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
246	14.83	32.9	1.017	5.04	31.40	106.55	Lost	Lost	32.65	Lost	35.74	1.094	Lost	1.139	Lost	1.076				
247	14.83	33.2	1.017	5.04	30.82	103.96	10.86	11.23	Lost	Lost	31.27	1.001	0.985	Lost	Lost	1.047				
248	14.83	33.1	1.017	5.04	30.20	101.21	10.09	10.70	33.97	Lost	30.25	0.934	0.934	1.019	Lost	1.082				
249	14.83	35.1	1.017	5.04	28.21	92.57	10.09	11.11	19.57	32.84	34.5[illegible]	1.032	1.048	1.115	0.728	1.084				
250	14.80	27.4	1.017	5.04	25.43	80.93	Lost	Lost	Lost	Lost	35.6[illegible]	Lost	1.153	Lost	Lost	1.10[illegible]				
251	14.80	28.5	1.017	5.04	31.63	107.67	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
252	14.80	28.6	1.017	5.04	29.08	96.39	Lost	11.50	Lost	Lost	21.6[illegible]	Lost	1.041	Lost	Lost	1.544				
253	14.80	29.2	1.017	5.04	32.78	112.82	Lost	Lost	28.83	Lost	19.1[illegible]	Lost	Lost	1.068	Lost	1.162				
254	14.80	29.4	1.017	5.04	30.51	102.66	Lost	11.02	Lost	Lost	Lost	Lost	1.063	1.075	Lost	0.994				
				5.04	29.52	96.44	10.88		29.[illegible]5			1.020		1.046			[illegible].59	29.45	1.018	1.079
				--	2.34	10.11											0.46	5.63	0.065	0.139
255	14.79	29.2	1.052	5.65	24.60	77.54	Lost	9.54	25.15	Lost	27.62	1.200	1.260	1.129	Lost	1.083				
256	14.79	28.7	1.052	5.65	23.71	73.92	Lost	Lost	26.63	Lost	28.79	Lost	1.212	1.304	Lost	1.416				
257	14.79	28.7	1.052	5.65	24.44	76.88	9.54	Lost	26.24	Lost	16.88	1.189	1.280	1.181	Lost	1.250				
258	14.80	32.0	1.052	5.65	24.20	75.91	9.82	Lost	25.53	23.61	26.26	1.142	1.296	1.269	1.110	1.078				
259	14.80	31.0	1.052	5.65	24.04	75.25	10.46	10.16	28.70	Lost	17.13	1.163	1.282	1.337	Lost	1.368				
260	14.80	31.2	1.052	5.65	24.57	77.41	9.71	Lost	27.89	Lost	16.48	1.090	1.006	1.288	Lost	1.288				
261	14.85	31.7	1.052	5.65	24.73	78.05	9.87	10.20	30.13	Lost	17.79	1.142	1.232	1.240	Lost	1.363				
Av				5.65	24.33	76.42	9.[illegible]9		24.65			1.192		1.240			9.72	24.24	1.174	1.193
σ				--	0.36	1.47											0.37	4.77	0.082	0.109
262	14.93	28.2	1.049	6.50	17.65	50.60	8.71	7.72	18.42	Lost	19.83	1.477	1.296	1.414	Lost	1.477				
263	14.93	27.6	1.049	6.50	18.14	53.48	8.55	8.02	13.80	Lost	23.54	1.426	1.188	1.257	Lost	1.175				
264	14.80	26.3	1.049	6.50	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
265	14.80	26.3	1.049	6.50	17.55	50.36	Lost	8.43	Lost	Lost	Lost	Lost	1.350	Lost	Lost	1.485				
266	14.85	30.7	1.049	6.50	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
267	14.79	26.9	1.049	6.50	18.14	52.52	9.55	8.83	19.07	Lost	24.40	1.438	1.406	1.295	Lost	1.547				
268	14.79	27.0	1.049	6.50	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost	Lost				
269	14.79	27.6	1.049	6.50	18.55	54.01	8.80	8.17	17.68	Lost	21.46	1.300	1.240	1.415	Lost	1.600				
270	14.79	28.3	1.049	6.50	18.34	53.25	8.89	Lost	18.83	Lost	23.54	1.350	1.230	1.302	Lost	1.549				
271	14.79	[illegible].0	1.049	6.50	18.60	54.19	8.94	8.07	20.16	Lost	19.32	1.262	1.172	1.710	Lost	1.451				
Av				6.50	18.18	52.63	8.55		20.42			1.318		1.436			8.52	20.10	1.299	1.446
σ				--	0.42	1.[illegible]5											0.49	2.21	0.[illegible]77	0.150

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